

Examining Impacts of the  
National Mail-Order Program  
on Medicare Service  
Utilization and Beneficiary  
Health Outcomes

*A report by Acumen for the Medicare Payment  
Advisory Commission*

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# Examining Impacts of the National Mail-Order Program on Medicare Service Utilization and Beneficiary Health Outcomes

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**Acumen**

**November 2019**

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## 1 EXECUTIVE SUMMARY

Reforms to payment for durable medical equipment, prosthetics, orthotics, and supplies (DMEPOS) have recently been subject to scrutiny from policymakers and stakeholders. Numerous reports and studies over the past decade have identified DMEPOS (including diabetic supplies) as highly susceptible to fraud and waste. To address these issues, the Medicare Prescription Drug, Improvement and Modernization Act (MMA) of 2003 required that a competitive bidding process be established and implemented for certain DMEPOS items, including diabetic testing supplies (DTS). There were three rounds of competitive bidding pertinent to DTS, out of which this analysis and report focus on the National Mail-Order Program (NMOP) that went into effect on July 1, 2013. While the program has achieved extensive savings, utilization of DMEPOS has declined. The Centers for Medicare and Medicaid Services (CMS) suggested that beneficiaries maintained adequate access to DTS and that the observed utilization declines were driven by reductions in inappropriate utilization (and the Government Accountability Office (GAO) approved of the methodology used by CMS to reach this conclusion), while other groups, such as the National Minority Quality Forum (NMQF), claimed that the utilization declines were signs of disrupted access and led to increases in adverse health outcomes.

This report aims to assess the effect of implementing the NMOP on utilization of DTS and beneficiary health outcomes using two groups of Medicare fee-for-service (FFS) beneficiaries that most likely need to obtain diabetic testing supplies on a regular basis: beneficiaries with diabetes (henceforth referred to as “diabetics”) and beneficiaries using insulin regularly (henceforth referred to as “regular insulin users”). The analysis—including examination of trends, regression analysis to remove the effects of demographic changes, and analysis of key cohorts—drew five general conclusions that are explained in more detail in the following sections of the report. The five main findings are as follows:

1. There was a substantial decline in utilization of mail-order diabetic test strips after the implementation of the NMOP in July 2013, but utilization of retail test strips increased somewhat.
2. Health outcomes (mortality, hospitalization, and emergency room visit rates) among Medicare diabetics and regular insulin users have remained stable after the implementation of the NMOP.
3. Our regression analysis further confirms that health outcome rates among regular insulin users are stable.
4. There was an increase in beneficiaries who stopped using test strips and in beneficiaries who purchased a new glucose meter after the implementation of the NMOP, but their health outcome rates were not negatively affected.
5. Beneficiaries continue to have access to local test strip retailers: 99% of FFS beneficiaries in 2017 lived in a county with at least one supplier that billed Medicare for retail test strips in that year.

## 2 OVERVIEW

Across Medicare fee-for-service (FFS) payment settings, the Centers for Medicare and Medicaid Services (CMS) has moved in recent years to address overutilization of services. Reforms to payment for durable medical equipment, prosthetics, orthotics, and supplies (DMEPOS) have gained particularly intense attention from policymakers and stakeholders. Beginning in 2011, CMS implemented a competitive bidding regime in 9 metropolitan statistical areas (MSAs), in which CMS received bids from suppliers to provide particular products. Payment rates were derived from the median of winning bids and suppliers that do not submit winning bids generally cannot serve the FFS beneficiaries in the MSA. After Round 1 of competitive bidding, CMS expanded the Competitive Bidding Program (CBP) to other regions over time, eventually covering 130 competitive bidding areas (CBAs) after the implementation of Round 1 2017 and Round 2 Recompete.<sup>1</sup> The result, in general, was a decline in utilization and reduced payments to suppliers. At the same time, to different degrees depending on the product, there has been concern voiced by industry and by patient advocates that lower payment rates have forced some suppliers to exit the market and impeded access to necessary DME among beneficiaries.

This tension has gained special scrutiny in the area of diabetic testing supplies (DTS), a widely used set of DME products. The bidding process for mail-order DTS was tested in the 9 Round 1 MSAs from January 2011 to December 2012. Later, in mid-2013, CMS created the National Mail-Order Program (NMOP), expanding the geographic scope of competitive bidding for DTS. This affected DTS provided in retail settings as well, since the payment rates for retail DTS were set equal to the mail-order rate. The recompete of NMOP commenced in mid-2016. While this round continued through the end of 2018, there has been intense pressure on CMS to revisit the competitive bidding program for DTS and other products, with proponents of policy changes pointing to industry-funded studies showing reduced access and adverse outcomes.

MedPAC contracted with Acumen, LLC to delineate the potential negative consequences associated with reduced access to needed diabetic supplies, such as increased emergency room visits or hospitalizations, and then to determine the extent to which Medicare beneficiaries experienced any of those negative outcomes as a result of the implementation of the NMOP.

This report documents the approach that MedPAC and Acumen used to examine changes in utilization of diabetic supplies and beneficiary health outcomes that may be associated with the NMOP and findings from these analyses. Specifically, this report encompasses the following chapters:

- **Chapter 3** provides examples of fraud and abuse associated with utilization of diabetic supplies that led to the implementation of competitive bidding and reviews some analyses conducted by other government agencies and stakeholders to study the impact of competitive bidding.
- **Chapter 4** details data and methods that we used to assess the impact of competitive bidding on utilization of diabetic supplies and beneficiary health outcomes.
- **Chapter 5** discusses limitations of our study.
- **Chapter 6** lists findings from our policy impact analyses.
- **Chapter 7** concludes this report with key takeaways.

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<sup>1</sup> Round 1 2017, Round 2 Recompete, and the National Mail-Order Recompete contracts expired on December 31, 2018. Round 2021 of the program has been announced by CMS and is scheduled to begin on January 1, 2021.

### 3 BACKGROUND

Medicare covers diabetic testing equipment and supplies, which include blood glucose monitors (BGMs), test strips, lancets, and therapeutic continuous glucose monitors (CGMs) for beneficiaries who are enrolled in Part B and have diabetes. The amount of supplies that are covered varies depending on whether the beneficiary uses insulin: for example, insulin users are able to get up to three times more test strips and lancets than non-insulin users.<sup>2</sup>

Medicare has historically paid for DMEPOS, which includes diabetic supplies, using a fee schedule that is generally based on supplier charges from the 1980s. CMS found that “the fee schedule prices paid by Medicare are excessive—sometimes three or four times retail prices and the amounts paid by commercial insurers”.<sup>3</sup> Numerous reports and studies over the past decade have identified DMEPOS (including diabetic supplies) as highly susceptible to fraud and waste. To address these issues, the Medicare Prescription Drug, Improvement and Modernization Act (MMA) of 2003 required that a competitive bidding process be established and implemented for certain DME items.

This chapter will first provide examples of fraud, abuse, and overpayment that have existed in the universe of diabetic supplies, and then introduce the competitive bidding policy and review recent studies that evaluated the impact of competitive bidding on utilization of DMEPOS and beneficiary health outcomes.

#### 3.1 FRAUD, ABUSE, AND OVERPAYMENT RELATED TO DIABETIC SUPPLIES

Prior to the implementation of competitive bidding, fee schedule payment rates were often excessive, which increased Medicare expenditures and likely encouraged inappropriate utilization.<sup>4</sup> The Office of Inspector General (OIG) has found numerous instances of improper payments for DTS, and these instances can be categorized under four broad categories: fraud, questionable billing, pricing loophole, and overutilization of DTS.

##### **Fraud**

Examples of fraud exhibited by DTS suppliers range from individual supplier actions to organized efforts by groups of suppliers. One example of fraud is the case of two companies named Four Leaf Clover, Inc. (FLC) and Team Tech Solutions (TTS). OIG alleged that FLC contracted with TTS to make unsolicited phone calls to Medicare beneficiaries, and paid TTS for each Medicare beneficiary referred for diabetes supplies. OIG also alleged that these beneficiaries were new customers, did not have an established relationship with FLC, and did not request in writing to be contacted regarding FLC’s DMEPOS. The actions of these two companies led to the submission of false and fraudulent Medicare claims for DTS in 2013.<sup>5</sup> Similarly, Arriva Medical, LLC was found guilty of submitting false claims to Medicare that were tainted by kickbacks paid to beneficiaries in the form of free or no cost home blood glucose meters or waived or uncollected copayments between November 2011 and August 2013.<sup>6</sup> In addition, CMS revoked

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<sup>2</sup> Centers for Medicare and Medicaid Services. “Current Medicare Coverage of Diabetes Supplies.” *CMS.gov*,

<https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/Downloads/SE18011.pdf>

<sup>3</sup> Centers for Medicare and Medicaid Services. “Medicare’s DMEPOS Competitive Bidding Program: Frequently Asked Questions.” *CMS.gov*, <https://www.cms.gov/outreach-and-education/outreach/partnerships/downloads/dmepospartnerfaqsrevised4813508.pdf>

<sup>4</sup> *Ibid.*

<sup>5</sup> Office of Inspector General, Department of Health and Human Services. *Spotlight On Diabetes Test Strips*.

<https://oig.hhs.gov/newsroom/spotlight/2014/test-strips.asp>.

<sup>6</sup> Department of Justice. April 24, 2019. *Two Former Arriva Medical Executives Agree To Pay \$1 Million To Settle Diabetic Testing Supply Fraud Allegations*. <https://www.justice.gov/usao-mdtn/pr/two-former-arriva-medical-executives-agree-pay-1-million-settle-diabetic-testing-supply>

Arriva's billing privilege because the agency found that Arriva billed for items/services provided to 211 Medicare beneficiaries who were deceased on each purported date of service.<sup>7</sup>

### **Questionable Billing**

Questionable billing was also prevalent in DTS claims prior to competitive bidding. Questionable billing practices include claims billed by suppliers that had an unusually high share of beneficiaries who received their test strips at perfectly regular intervals (which suggests that suppliers automatically provided refills as opposed to beneficiaries specifically requesting refills, which is required by Medicare). OIG identified nearly 5,000 suppliers that had unusually high billing for at least one questionable billing measure, such as multiple test strip claims submitted for the same patient by the same supplier in overlapping time periods. In total, Medicare paid \$425 million for questionable billings from these suppliers.<sup>8</sup>

Additionally, after reviewing 400 claims across four Medicare Administrative Contractors (MACs), OIG found that 303 (over 75 percent) had 1 or more issues associated with the claim. Some of the most common issues were missing or incomplete physician orders and the quantity of supplies exceeding Medicare guidelines without any documentation to support the additional supplies. These problematic claims resulted in an estimated total of \$209 million in improper payments in 1 year. OIG also found that, in 2011, Medicare improperly paid \$6 million for test strip claims that were missing a diabetes diagnosis code or that inappropriately overlapped with patients' hospital or skilled nursing facility stays.<sup>9</sup>

### **Pricing Loophole**

A third area of concern is improper payment related to a pricing loophole. OIG found that Medicare paid \$55 million for retail test strips for patients living far away from their suppliers.<sup>10</sup> Before 2013, Medicare's payment rates for retail DTS were higher than the rates for mail-order DTS, leading some suppliers to bill mail-order DTS as retail. A review of Medicare claims data showed that claims for the more expensive, retail test strips increased from 2010 to 2011 while claims for the less expensive, mail-order test strips decreased during the same period.<sup>11</sup> Furthermore, it was found that some suppliers billed Medicare for retail test strips, but provided the less expensive, mail-order test strips.<sup>12</sup> A report also found that suppliers may have been taking advantage of the difference in payment rates by delivering test strips in company-owned vehicles in order for the test strips to qualify as retail and receive a higher reimbursement rate, costing Medicare millions.<sup>13</sup> Though the American Taxpayer Relief Act of 2012 eliminated the reimbursement rate difference, the prevalence of questionable billing practices strengthened the case for closer monitoring of policies that control the pricing of DTS and DMEPOS in general.

### **Overutilization**

A fourth concern is overutilization of DTS. A study conducted by the New York Times found that there is a substantial resale market of test strips, which is evidence of patients receiving an excessive amount of

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<sup>7</sup> Departmental Appeals Board, Department of Health and Human Services. March 28, 2019. *Final Decision on Review of Administrative Law Judge Decision*. <https://www.hhs.gov/sites/default/files/board-dab-2934.pdf>

<sup>8</sup> Office of Inspector General, Department of Health and Human Services. August 2013. *Inappropriate and Questionable Medicare Billing for Diabetes Test Strips (OEI-04-11-00330)*. Washington, DC: OIG.

<sup>9</sup> Ibid.

<sup>10</sup> Office of Inspector General, Department of Health and Human Services. *Spotlight On Diabetes Test Strips*. <https://oig.hhs.gov/newsroom/spotlight/2014/test-strips.asp>

<sup>11</sup> Office of Inspector General, Department of Health and Human Services. November 2012. *Supplier Billing for Diabetes Test Strips and Inappropriate Supplier Activities in Competitive Bidding Areas (OEI-04-11-00760)*. Washington, DC: OIG.

<sup>12</sup> Ibid.

<sup>13</sup> Office of Inspector General, Department of Health and Human Services. March 2014. *Results of Reviews at Three Suppliers of Diabetic Testing Supplies (A-09-13-02032)*. Washington, DC: OIG.

test strips, compared to what they actually needed. One of the examples covered in this article is that of the Langley brothers who launched a website called Teststripz.com and solicited test strips from roughly 8,000 people for resale.<sup>14</sup>

### 3.2 THE COMPETITIVE BIDDING PROGRAM

In an effort to reduce fraud and overutilization, improve the price-setting methodology for DMEPOS, and cut back on Medicare and beneficiary spending, the MMA of 2003 required that competitive bidding for certain DME items, including DTS, be phased in over time. Under the program, CMS receives bids from suppliers and selects a sufficient number of eligible suppliers that have offered the lowest bids to furnish DME items to beneficiaries in designated CBAs. The competition process also determines the payment using the median of all winning bids, referred to as the single payment amount (SPA), for each DME item included in the program, where each DME item is identified by a HCPCS code. With the expiration of all competitive bidding contracts on December 31, 2018, CMS is changing how SPAs are determined and will implement these changes in the next round of competitive bidding that is scheduled to begin on January 1, 2021.<sup>15</sup>

Beginning in January 2011, CMS implemented competitive bidding in 9 CBAs. This round of competitive bidding, referred to as the Round 1 Rebid, included a mail-order DTS category. The Round 1 Rebid lasted 3 years, but the mail-order DTS component only lasted 2 years, through December 2012. Six months later (on July 1, 2013), CMS established the National Mail-Order Program for DTS, which expanded competitive bidding for mail-order DTS nationwide. Also, pursuant to the American Taxpayer Relief Act of 2012, CMS set the payment rate for retail DTS equal to the payment rate established for mail-order DTS under competitive bidding beginning in July 2013. After three years, CMS conducted a new round of competitive bidding for mail-order DTS, and the National Mail-Order Program Re compete, which contained the same HCPCS as the previous round of DTS bidding, began on July 1, 2016. This round of bidding continued through December 31, 2018. See the table below for more information.

*Table 3-1. Competitive Bidding of DTS*

Round	Effective Period	Region	Mail-Order Rate	Retail Rate
Round 1 Rebid	1/1/2011 – 12/31/2012	9 CBAs	Single Payment Amount (SPA)	Fee Schedule Amount
National Mail-Order Program	7/1/2013 – 6/30/2016	Nationwide	SPA	SPA
National Mail-Order Re compete	7/1/2016 – 12/31/2018	Nationwide	SPA	SPA

The DTS category included in the National Mail-Order Program consists of 8 HCPCS codes. Among these 8 codes, roughly 90 percent of Medicare expenditures are associated with one code – blood glucose test strips (A4253). Test strips are used in conjunction with a glucose meter (E0607) to measure

<sup>14</sup> Alcorn, Ted. “The Strange Marketplace for Diabetes Test Strips.” *The New York Times* 14 Jan. 2019. Web. 25 Apr. 2019.

<sup>15</sup> Competitive Bidding Implementation Contractor. “Round 2021: Lead Item Pricing Fact Sheet.” <https://dmecompetitivebid.com/cbic/cbic2021.nsf/DocsCat/FAct%20Sheets~JSKRC0ZIZT?open&navmenu=|>. Beginning in Round 2021, CMS is implementing the lead item pricing methodology. Each product category will have a lead item that has been pre-identified based on highest total allowed charges nationwide for bidding purposes. The SPA for the lead item HCPCS code is the maximum bid submitted for that item by suppliers whose bids for the item are in the winning range for that CBA and product category combination. The SPAs for all other HCPCS codes within the product category are determined by multiplying the lead item SPA by a relative ratio (determined based on historic differences in the fee schedule amounts for the lead item and non-lead items).



beneficiaries' blood glucose levels. While test strips were included in competitive bidding, glucose meters were not.

### **Impact of Competitive Bidding**

Multiple government agencies and stakeholders have studied the impact of competitive bidding. While the program has achieved extensive savings, utilization of DMEPOS has declined. CMS believed that beneficiaries maintained adequate access to DTS and that the observed utilization declines were driven by reductions in inappropriate utilization. The Government Accountability Office (GAO) conducted an analysis of CMS' statements, and concluded that the CMS methodologies and scoring algorithm used to evaluate health measure trends among competitively bid regions appear to be sound.<sup>16</sup> However, some other groups such as the National Minority Quality Forum (NMQF), claimed that the utilization declines were signs of disrupted access and led to increases in adverse health outcomes.<sup>17</sup>

Since the first round of competitive bidding, CMS has been conducting real-time claims analysis to monitor health status for groups of Medicare beneficiaries in CBAs. The agency reported that it has not detected any changes in health outcomes like emergency room admissions, hospital admissions, and mortality that can be attributed to competitive bidding.<sup>18</sup> As a result of the Competitive Bidding Program, 2011 payment rates for mail-order DTS for beneficiaries living in CBAs were lower than payment rates for mail-order DTS for beneficiaries living in non-CBP regions. More specifically, the average Medicare payment for mail-order test strips for beneficiaries in CBAs was \$14.62 per 50-count box, which is less than half of either the average payment for mail-order test strips in non-bid areas—\$32.47—or the national average payment for retail test strips (which were not competitively bid)—\$37.67.<sup>19</sup> The lower payment rates contributed to the decline in annual Medicare expenditures for DTS from \$1.6 billion in 2010 (the year before competitive bidding was first implemented) to \$0.3 billion in 2015, a decline of nearly 80 percent.<sup>20</sup> Additionally, Medicare expenditures on DTS has declined by reducing excess utilization. For example, there was an 87% decrease in Medicare allowed charges for test strip claims for beneficiaries in excess of utilization guidelines from 2010 (pre-competitive bidding) to 2011 (after implementation of competitive bidding).<sup>21</sup>

The GAO conducted a study in September 2016 to examine the extent to which the NMOP affected utilization of CBP-covered DME items and beneficiaries' access to DME items. GAO found that the number of beneficiaries who received diabetic testing supplies through the NMOP decreased 39 percent between 2012 and 2014, with a corresponding 13 percent increase in the number of beneficiaries receiving these materials through retail outlets. In the meantime, the agency conducted a limited health outcome analysis and agreed with CMS that the CBP did not affect health measures. The agency also reviewed CMS's health status monitoring methodologies and concluded that they "appear to be sound".<sup>22</sup>

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<sup>16</sup> U.S. Government Accountability Office. September 2016. *CMS's Round 2 Durable Medical Equipment and National Mail-order Diabetes Testing Supplies Competitive Bidding Programs* (GAO-16-570).

<sup>17</sup> Puckrein et. al. 2016. "Impact of CMS Competitive Bidding Program on Medicare Beneficiary Safety and Access to Diabetes Testing Supplies: A Retrospective, Longitudinal Analysis." *Diabetes Care*. DOI: 10.2337/dc15-1264.

<sup>18</sup> Centers for Medicare and Medicaid Services. "Health Status Monitoring." *CMS.gov*, <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/DMEPOSCompetitiveBid/Monitoring.html>.

<sup>19</sup> Office of Inspector General, Department of Health and Human Services. June 2017. *Medicare Market Shares of Mail-Order Diabetes Test Strips From October Through December 2016* (OEI-04-16-00473). Washington, DC: OIG.

<sup>20</sup> MedPAC. June 2018. *Report to the Congress: Medicare and the Health Care Delivery System*. [www.medpac.gov/docs/default-source/reports/jun18\\_ch6\\_medpacreport\\_sec.pdf](http://www.medpac.gov/docs/default-source/reports/jun18_ch6_medpacreport_sec.pdf).

<sup>21</sup> Office of Inspector General, Department of Health and Human Services. August 2013. *Inappropriate and Questionable Medicare Billing for Diabetes Test Strips* (OEI-04-11-00330). Washington, DC: OIG.

<sup>22</sup> U.S. Government Accountability Office. September 2016. *CMS's Round 2 Durable Medical Equipment and National Mail-order Diabetes Testing Supplies Competitive Bidding Programs* (GAO-16-570).

Therefore, this GAO report tends to confirm the findings of CMS, which believes that the CBP may have curbed fraud and unnecessary utilization.

On the contrary, some groups have suggested that the decline in utilization indicates beneficiaries were not able to access needed test strips. One study conducted by the National Minority Quality Forum (NMQF) found that Round 1 Rebid created access issues for beneficiaries and increased hospital admissions, mortality, and costs.<sup>23</sup> The study population consisted of over 40,000 insulin users in nine areas with competitive bidding (treatment group), and over 485,000 insulin users in areas without competitive bidding (control group). The authors found that relative to beneficiaries in the control group, a larger portion of beneficiaries in the treatment group shifted from full acquisition of diabetic testing supplies in 2010 to partial or no acquisition in 2011, and that in both study groups, this migration was associated with an increase in adverse health outcomes. Based on these findings, the authors concluded that competitive bidding led more beneficiaries to shift from full testing supply acquisition to partial or no acquisition, with associated increases in mortality, inpatient admissions, and costs.

The goal of this document is to provide an independent study for MedPAC to examine potential negative consequences associated with reduced access to needed DTS as a result of the implementation of competitive bidding. This report specifically focuses on the National Mail-Order Program (NMOP) that was implemented in 2013, as this was the first round of competitive bidding for DTS that applied nationwide. This document will provide an overview of the methodology employed in the analyses, the results of the analyses, and the limitations of this study.

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<sup>23</sup> Puckrein et. al. 2016. "Impact of CMS Competitive Bidding Program on Medicare Beneficiary Safety and Access to Diabetes Testing Supplies: A Retrospective, Longitudinal Analysis." *Diabetes Care*. DOI: 10.2337/dc15-1264.

## 4 DATA AND METHODS

Our framework for assessing the effect of the NMOP on utilization of Medicare services and beneficiary health outcomes consists of three parts: trend analysis, regression analysis, and cohort analysis. In this chapter, we will discuss the data sources and analytical approach used in these analyses.

### 4.1 DATA AND STUDY POPULATIONS

We used a combination of the following data sources:

- *Medicare Enrollment Data Base (EDB)*: includes beneficiary enrollment and demographic information from 2010 to 2017 (processed through September 2018)
- *Common Working File (CWF)*: includes final action Medicare FFS claims from 2010 to 2017 (processed through October 19, 2018)
- *Part D Prescription Drug Event (PDE)*: includes Medicare Part D claims from 2010 to 2017 (processed through October 21, 2018)
- *Provider Enrollment, Chain, and Ownership System (PECOS)*: includes provider enrollment data (processed through January 2019)

For the study population, we focused on two groups of Medicare FFS beneficiaries that most likely need to obtain diabetic testing supplies on a regular basis: beneficiaries with diabetes (henceforth referred to as “diabetics”), and beneficiaries using insulin regularly (henceforth referred to as “regular insulin users”).

#### **Diabetics**

We defined diabetics as beneficiaries enrolled in Original Medicare (enrolled in both Parts A and B but not in a Medicare Advantage plan)<sup>24</sup> who had an inpatient, outpatient, or physician service claim that reported a diagnosis code for diabetes for the month of observation or any of the prior six months. Considering that a non-diabetic or a pre-diabetic could receive a diabetes diagnosis,<sup>25</sup> we excluded laboratory test claims and other claims with the same service date as the lab test because they are most likely related to diabetes screening, and including them could result in a large number of false positives. We further divided the diabetic population into type 1 and type 2 diabetics because type 1 diabetics are considered more vulnerable than type 2 diabetics and there could be different trends in utilization of diabetic supplies and health outcomes between the two cohorts. We identified type 1 and type 2 diabetics based on ICD-9 and ICD-10 diagnosis codes reported on the claim.<sup>26</sup> We classified beneficiaries who had both type 1 and type 2 diagnoses during the same time period as type 1 to create mutually exclusive groups.

#### **Regular Insulin Users**

We defined regular insulin users as beneficiaries whose average weekly dosage of Part D insulin is at least 280 units<sup>27</sup> for 12 weeks prior to the first day of the study month. We elected to use a lookback period of 12 weeks for several reasons. First, a shorter lookback period allows us to keep more recent insulin users in our study population and, second, because most insulin refills last less than 12 weeks, this means we can expect to obtain a robust picture of recent insulin usage in this timeframe. Next, we calculated insulin dosage by grouping insulin fills by insulin type (i.e., short, rapid, intermediate, and long-

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<sup>24</sup> Beneficiaries enrolled in Medicare Advantage were not subject to the DMEPOS competitive bidding program.

<sup>25</sup> One challenge of using claims data to identify diabetics is the inaccuracy of diagnosis coding. We will discuss this issue in more depth in Chapter 5.

<sup>26</sup> Please refer to Appendix A for a list of type 1 and type 2 diagnosis codes.

<sup>27</sup> The international unit of insulin is the most basic mass measure of insulin. One international unit of insulin is defined as the biological equivalent of 34.7 micrograms of pure insulin.

acting insulin) and measuring the total days until a refill is observed.<sup>28</sup> Distinguishing between insulin types is of particular importance in order to correctly identify refills and thus calculate the correct average daily dose of insulin. For example, a beneficiary could have a fill for short-acting insulin, followed immediately by a fill for long-acting insulin, and followed later by another fill for short-acting insulin. Our approach allows us to correctly identify the third fill as the refill for the original fill of short-acting insulin, and allows us to track daily dosage separately for each insulin type. The total insulin, in units, from the original fill was then divided by the total days, producing an average daily insulin dosage for each insulin fill. For a beneficiary's final fill for a given insulin type, we assumed the daily dosage was the same as for the previous fill. For cases where a beneficiary only had one fill for a given insulin type, we assigned a daily dosage equal to the median daily dosage for that insulin type across all insulin fills. Finally, in cases where a beneficiary concurrently uses multiple types of insulin, their daily insulin dosage is simply aggregated across each type of insulin they are actively using. The threshold of 280 units per week for 12 weeks was determined after we analyzed the distribution of weekly dosage of insulin among Medicare beneficiaries enrolled in Part D and consulted clinicians.<sup>29</sup> This threshold should enable us to capture beneficiaries using a considerable amount of insulin continuously, in other words, "regular" insulin users.

Notably, the enrollment requirements for regular insulin users are slightly different between the trend analysis and the regression analysis. For the trend analysis, we required the regular insulin users to be enrolled in Parts A and B but did not separately check for Part D enrollment because beneficiaries with 12 weeks of insulin claim coverage would necessarily have been enrolled in Part D. This enrollment requirement is sufficient for us to observe DTS usage and health outcome patterns for beneficiaries who use insulin regularly. However, for the regression analysis, we started off by constructing a base population with Parts A, B, and D enrollment (and without a Medicare Advantage plan) and then divided it into regular insulin users (using the same 280-unit-12-week threshold) and the comparison group (beneficiaries who did not meet the insulin usage threshold and the diabetic population criteria). The main purpose of the Part D enrollment check was to prevent beneficiaries who were not enrolled in Part D but were insulin-dependent from being captured in the comparison group.

Finally, we made two data restrictions: we excluded beneficiaries living in areas that were classified as CBAs for mail-order DTS under Round 1 Rebid based on their residential zip codes on the first day of each observation period (i.e., the first day of each calendar month for trend and cohort analyses; the first day of each 4-week period for the regression analysis),<sup>30</sup> because they had a competitive bidding program for DTS in place from January 2011 to December 2012 and could have different DTS utilization and health outcome trends than beneficiaries living in other regions. Also, when examining health outcome trends for 2010-2017, we found that a number of metrics defined by diabetes-related diagnosis codes changed noticeably after the transition from ICD-9 to ICD-10 in October 2015. We therefore limited our analysis of the impact of the NMOP on beneficiary health outcomes to the January 2010 – September 2015 period.

## 4.2 TREND ANALYSIS

After identifying data sources and study populations, we began with analyses of monthly trends of DTS utilization and beneficiary health outcomes, which would help us obtain a high-level picture of the effect of competitive bidding before conducting the regression analysis.

### **Utilization of Diabetic Supplies**

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<sup>28</sup> A list of National Drug Codes (NDCs) for insulin and the type of fills can be found in Appendix B.

<sup>29</sup> The distribution of weekly insulin dosage can be found in Appendix C.

<sup>30</sup> The only analysis in this report that includes beneficiaries residing in Round 1 CBAs is the retail supplier analysis (Sections 4.5 and 6.4).

Recent studies have shown that the NMOP reduced the amount of DTS received by Medicare beneficiaries. To verify this finding, we summarized monthly trends in the number of unique beneficiaries, number of unique suppliers, number of allowed services, allowed charges, and assignment rates for each of the eight types of diabetic testing products (stratified by mail-order vs. retail) included in the competitive bidding program, as well as glucose meters, which were not part of the NMOP but might have been affected by the program.<sup>31</sup> All these numbers are based on allowed claims—claim lines with an allowed charge greater than zero.

In addition, we examined trends in utilization of diabetic test strips among diabetics and regular insulin users specifically, because continuous access to test strips enables these beneficiaries to test their glucose levels regularly. We computed two sets of monthly statistics: average number of strips per outpatient day and usage rates. The average number of strips measures the amount of test strips available to the beneficiary for home use. To calculate this metric, we first identified all DMEPOS claims containing HCPCS code “A4253” (blood glucose test or reagent strips for home blood glucose monitor, box of 50). Then, for each claim, we calculated average test strips per day by dividing the total number of test strips (`DME_UNIT` multiplied by 50, because HCPCS code A4253 represents 50 strips) by the span of service, which was defined to include all days between `EXPNSDT1` and `EXPNSDT2`. Next, for each month, we calculated total test strips that a beneficiary received by multiplying average test strips per day by the number of days that the claim overlaps the month of observation. We also calculated the number of outpatient days, defined as days that the study population (diabetics or insulin users, regardless of test strip usage) had in a given month minus the days when they were in a hospital or nursing home, because Medicare payment for any test strips used during a Part A stay is bundled into the facility payment and is thus non-observable in Part B claims. Finally, we added up total test strips for all beneficiaries in a given month and divided the sum by the total number of outpatient days to arrive at monthly average number of test strips per outpatient day. The other set of statistics, the usage rate, is simply the percentage of beneficiaries in the study population who had a test strip claim covering at least one day of that month. One key caveat to keep in mind for both metrics is that they are based on Medicare claims and thus measure the number of test strips that beneficiaries received, rather than the number that they actually used, which may have been lower.

Through the analyses described above, we confirmed that the NMOP led to a decline in utilization of diabetic test strips.<sup>32</sup> However, it is difficult to determine whether the reduction in the amount of test strips that Medicare provided was due to oversupply in the pre-NMOP period or a sign of beneficiaries having trouble obtaining adequate test strips. We will discuss this challenge in more depth in Chapter 5, where we will list possible but unobservable reasons for the utilization decline.

### **Beneficiary Health Outcomes**

Restricted access to diabetes testing supplies could lead to poor management of diabetes. In the short term or long term, poor management could result in complications severe enough to require hospitalizations, emergency room (ER) visits, or even result in death. Therefore, a key component of our analysis is assessing the impact of NMOP on the incidence of mortality, hospitalization, and ER visits among Medicare FFS diabetics and regular insulin users. We summarized monthly rates of mortality, hospitalization, and ER visits and conducted a separate regression analysis of these health outcomes to account for any effects due to changes in patient demographic characteristics. This section will focus on explaining the methodology used to calculate monthly rates, and Section 4.3 will explain the regression analysis.

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<sup>31</sup> A list of HCPCS codes for these 9 items can be found in Appendix D.

<sup>32</sup> Detailed findings are discussed in Chapter 6.

Monthly rates were calculated as the percentage of beneficiaries in the diabetic or insulin user groups who experienced death, a hospitalization, or an ER visit. Death information was found in Medicare enrollment data, hospital admissions were defined using inpatient claims, and ER visits were defined using inpatient and outpatient claims that contain a revenue center code 0450-0459 or 0981. In addition to all-cause hospitalization and ER visits, we separately examined visits due to certain complications of poor glucose management by cross-matching the principal diagnosis code field of the inpatient or outpatient claim to the diagnosis codes in hierarchical condition categories (HCCs) for diabetes.<sup>33</sup> In addition, we separately calculated rates of a common acute complication: diabetic ketoacidosis (DKA). DKA occurs when the body cannot produce enough insulin to allow for glucose to be used inside cells as a fuel source. Instead, fat is broken down by the liver into a fuel called ketones. When ketones are produced too quickly and build up in the blood and urine, they can be toxic by making the blood acidic. DKA is a common complication in type 1 diabetes and one that has become increasingly common in type 2 diabetes.

Another outcome metric that we included in our analysis is Medicare spending per capita. Restricted access to diabetic supplies could lead to increased utilization of other medical services (e.g., inpatient stays due to complications of poor management of diabetes) and therefore increased total Medicare spending per beneficiary. To compute this metric, we first identified all Parts A and B claims (including inpatient, outpatient, carrier, DME, SNF, home health, and hospice claims) for beneficiaries in our study populations (diabetics and insulin users), standardized the allowed charge amounts billed on their claims to facilitate comparisons of resource use across geographic areas,<sup>34</sup> and divided the sum of standardized payments for our study populations for a given month by the number of beneficiaries to arrive at Medicare spending per capita.

### 4.3 REGRESSION ANALYSIS

This section introduces the specifications of the regression model that we employed to further assess the impact of competitive bidding on beneficiary health outcomes. The primary research goal of this model is to more accurately assess trends in adverse health outcomes by adjusting outcome rates for demographic changes in the underlying population. With this goal in mind, we specified a logit regression model to estimate the probability of a beneficiary experiencing an adverse health outcome controlling for both time and demographic characteristics.

#### **Logit Regression Model Specifications**

The model that we built takes the form of equation 1.1 below:

$$(1.1) \quad \text{logit}(p(\text{outcome})) = \sum_{t=1}^p \beta_t \cdot \text{Time}_t + \sum_{i=1}^n \theta_i \cdot M_i$$

The components of this model are defined in the following way:

1.  $p(\text{outcome})$ : a measurement of the estimated probability of experiencing the specified adverse health outcome;

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<sup>33</sup> Appendix E contains a list of diagnosis codes under the HCCs for diabetes.

<sup>34</sup> The price standardization methodology removes sources of variation that are not directly related to decisions to utilize care, such as local or regional price differences. Specifically, the methodology eliminates the effect of geographic adjustment factors, such as the hospital wage index and geographic practice cost index (GPCI), and substitutes a national amount in the case of services paid on the basis of State fee schedules. It also eliminates payments to certain hospitals (e.g., those serving a disproportionate population of poor and uninsured) and payments associated with incentive payment programs. However, the methodology does not standardize payment amounts across years; in other words, annual Medicare payment rate increases are not taken into account. Detailed documentation can be found here:

[www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350](http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier4&cid=1228772057350)

2. *Time*: a series of indicator variables for 4-week periods before and after the implementation of competitive bidding;
3. *M*: a set of demographic characteristics.

This model can be run iteratively over a wide variety of definitions of both base populations and adverse health outcomes. For the initial specification of this model, we analyzed three adverse health outcomes in the insulin-using population described in Section 4.1: mortality, diabetes-related hospitalization, and diabetes-related emergency room visits. Each model run will generate a series of regression estimates, including coefficients, p-values, and standard errors, for each predictor variable on the right-hand side of the equation. The coefficient for a predictor variable in a logit regression represents the natural log of the odds ratio, or the relative odds of experiencing the outcome when a predictor variable changes values. For example, the odds ratio for time period July 1, 2013, through July 28, 2013, measures the ratio of the probability of a positive versus negative outcome for beneficiaries in that time period, relative to the same probability ratio for beneficiaries in the baseline time period (which in our analysis was January 18, 2010, through February 14, 2010). Defining the time period based on 4-week blocks allows for a fair comparison of health outcome rates across periods with the same number of workweeks and weekends. Finally, the p-value corresponding to each predictor variable measures the level of statistical certainty that the predictor has an effect, negatively or positively, on the probability of the outcome. Finally, Table 1 in Appendix F provides a full list of the time periods and demographic characteristics that were included in this model.

### **Comparison Group Analysis**

In addition to the initial model specification above, we further specified a version of the empirical model to study trends in a comparison group. We defined our comparison group as beneficiaries who had Parts A, B, and D coverage but were not enrolled in a Medicare Advantage plan and were not classified as diabetics or regular insulin users. Chapter 5 goes into more detail on the challenges associated with identifying a proper control group, given that the NMOP was implemented nationally in July 2013. Further, because the fee schedule price for retail diabetic supplies was also impacted by this program, we are further restricted in identifying diabetics and insulin users who were plausibly unaffected by the program. These challenges ultimately mitigate the value of any comparison group analysis. Nevertheless, in choosing beneficiaries who were not diabetics or insulin users as our comparison group, our goal is simply to compare long-term trends in adverse health outcome rates to better contextualize the specific trends we may observe in the group of regular insulin users, whom we analyze in our initial empirical model specification.

### **Post-Regression Analysis**

While the output of the logit regression above provides us the odds ratio for predictor variables, it does not tell us the actual marginal effect in clear terms. To measure this marginal effect, we used the regression output to calculate the predicted probability of each beneficiary in our study population experiencing an adverse health outcome under several counterfactual scenarios. Counterfactual analysis answers questions like "what would the probability of death or hospitalization be if a beneficiary in a given time period were instead in a different time period." This approach allows us to isolate the effect of certain treatment variables, time in this case, on a population with unchanging demographic characteristics. Ultimately, this counterfactual analysis allows us to calculate an average expected outcome rate for our beneficiary subpopulation at each time period in our study, controlling for the demographic characteristics of this group. These average expected outcome rates can then be graphed in a manner similar to our unadjusted outcome rates, which are discussed in section 4.2.

#### 4.4 COHORT ANALYSIS

Apart from the trend and regression analyses, we conducted cohort analyses to better understand the effects of the NMOP on two groups of beneficiaries: those who stopped receiving test strips and those who received a new glucose meter.

##### **Beneficiaries who Stopped Receiving Test Strips**

The utilization analysis indicated that fewer beneficiaries were using test strips after the implementation of the NMOP in July 2013. Therefore, we identified beneficiaries who stopped receiving test strips after the policy change. Specifically, we defined “stoppers” as beneficiaries who had an allowed claim containing HCPCS code “A4253” in June 2013 but had no such claims in the following 6 months (July-December), and were enrolled in Parts A and B (and not in an MA plan) from June through December 2013 (including beneficiaries who passed away during this time period).<sup>35</sup> For comparison, we used the same method to identify stoppers in June 2012 and June 2014. Then we analyzed: the stoppers’ demographic characteristics, such as age, gender, race, dual status (enrollment in both Medicare and Medicaid), and residence in rural areas; the patterns of their test strip claims, for example, whether the claims were concentrated in particular suppliers or geographic areas; and their health outcomes (mortality, hospitalization, and ER visits) immediately after they received the last supply of test strips in June. We performed a similar analysis for the subset of beneficiaries who were regular insulin users in June of the three years of interest. These analyses help us address two questions: whether the composition of stoppers changed after the NMOP, and whether the beneficiaries who stopped receiving test strips after the start of the NMOP had a higher rate of adverse health outcomes in the short term.

##### **Beneficiaries who Obtained a New Glucose Meter**

Apart from test strip stoppers, another population of interest consists of beneficiaries who had to switch to a different brand of glucose meter because they could not obtain test strips compatible with their old glucose meter. We identified this population by checking for HCPCS code “E0607” on DME claims. The utilization analysis for E0607 showed a surge of claims between May and October 2013, right around when the NMOP was implemented. Therefore, we focused on beneficiaries who had an allowed E0607 claim during that period and used the same method to identify users of new glucose meters in 2012 and 2014 to construct comparison groups. For the three groups of new glucose meter users, we analyzed their test strip claim patterns 180 days before and 180 days after receiving the meter and their health outcomes in the 180 days following the receipt of a new glucose meter.

To contextualize the specific trends that we may observe in new glucose meter users, we extended the health outcome analysis to cover beneficiaries who did not purchase a new glucose meter. Specifically, we compared health outcomes rates for continual test strip users who purchased a new glucose meter and the rates for continual test strip users who did not purchase a new meter. We defined continual test strip users as beneficiaries who were enrolled in Parts A and B (and not in an MA plan) for the entire year of 2012, 2013, or 2014 (including those who passed away during the year) and had an allowed test strip claim in the first and second half of the year.<sup>36</sup> We then identified those who had an allowed glucose meter claim in June or July, and those who did not have an allowed glucose meter claim from May to

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<sup>35</sup> For example, if a beneficiary was enrolled in Parts A and B (and not in an MA plan) in June but passed away later in the month, we would still include him in the study population to analyze mortality rates. The continuous enrollment requirement was applied to ensure that we find all Original Medicare claims for the beneficiary for June through December, and then properly define “stoppers” and identify their health outcomes during the time period.

<sup>36</sup> This is to ensure that we accurately identify the two study cohorts and their health outcomes with all observable claims. Similar to the test strip stopper analysis, we included beneficiaries who were deceased to measure mortality.



October.<sup>37</sup> Finally, we calculated health outcome rates during July-December for the two subpopulations. These analyses help us answer the question of whether the rapid increase in glucose meter claims driven by the implementation of the NMOP in 2013 resulted in negative health outcomes in the short term.

#### 4.5 RETAIL SUPPLIER ANALYSIS

After observing the decline in utilization of mail-order test strips and in the number of mail-order suppliers, we conducted a separate analysis to look at the availability of retail suppliers in the entire nation (including Round 1 CBAs) by county. The NMOP awarded contracts to a limited number of suppliers that would meet the national need for mail-order DTS. However, suppliers can still furnish retail DTS without winning a contract. Therefore, retail DTS remains an alternative option for beneficiaries who may find it difficult to purchase mail-order DTS. But since obtaining DTS from local stores requires an in-person visit, it is important that the supplier is within accessible distance to the patient's home. To find out whether retail DTS suppliers are generally accessible, we identified all suppliers that had at least one allowed claim for retail test strips in 2017<sup>38</sup> and the counties where these suppliers were located, based on the zip code listed in the Provider Enrollment, Chain and Ownership System (PECOS).<sup>39</sup> We then calculated the percentage of beneficiaries who resided in a county with at least 1, 2, 5, 10, 50, and 100 suppliers in 2017. If a substantial portion of beneficiaries live in counties without any retail test strip suppliers, it would suggest that beneficiaries who have difficulty obtaining mail-order test strips might face potential access issues. The results of this analysis are discussed in Section 6.4.

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<sup>37</sup> The number of glucose meter users peaked in June and July 2013, so we selected June and July to capture beneficiaries who most likely received a new meter because of the NMOP. On the other hand, we tried to establish a comparison group that did not purchase a new meter because of the policy change, so we selected a more restrictive time period and required the beneficiaries to have no allowed claims from May through October 2013 (months with elevated glucose meter billings). To facilitate comparison, study cohorts in the other two years were defined in the same manner.

<sup>38</sup> 2017 is the latest year for which complete claims data were available at the time of conducting this analysis.

<sup>39</sup> The zip code is associated with each supplier's location, rather than the headquarter location.

## 5 LIMITATIONS

This chapter discusses challenges of using available data to examine the impact of the NMOP on utilization of diabetic testing supplies and beneficiary health outcomes.

### **Identifying Diabetic Populations**

A key component of our analysis is to define study populations accurately. However, inconsistent Medicare billing practices pose significant challenges, requiring the development of reliable methods to overcome them. For example, when defining the diabetic population using all inpatient, outpatient, and physician services claims data, we discovered that some beneficiaries enter and leave the population intermittently. Further analysis demonstrated that a sizeable percentage of the “diabetics” originally defined based on all claims are beneficiaries whose diabetes diagnoses come from annual or semi-annual lab tests. After consulting clinicians and researching Medicare’s coverage guidelines<sup>40</sup>, we decided to remove lab test claims and other claims that may be related to the tests (e.g., interpretation of test results), because these services are likely to monitor glucose levels for beneficiaries who are pre-diabetic or those with diabetes risk factors. After removing the lab tests and related claims, we calculated that the monthly incidence rate for diabetes was about 20%, which is close to beneficiaries’ self-reported rate published in CMS’s Medicare Current Beneficiary Survey (MCBS)<sup>41</sup> and some research articles.<sup>42</sup>

Another issue with identifying the diabetic population is determining whether the beneficiary has type 1 or type 2 diabetes. Our analysis found that almost all beneficiaries with a type 1 diagnosis received a type 2 diagnosis at some point, so we decided to prioritize type 1 over type 2 if both diagnoses appear on claims during the same time window. This approach yielded a monthly incidence rate of 2% for type 1 diabetes and 18% for type 2 diabetes. These numbers align well with the self-reported rates of 2% for type 1 diabetes and 19% for type 2 diabetes in the MCBS.

### **Monitoring Access to Diabetic Testing Supplies**

A central concern related to the NMOP is the potential for disruptions in access to medically necessary diabetic testing supplies for diabetic beneficiaries. To monitor and evaluate access to these products, we developed a methodology in Chapter 4 to measure the total number of diabetic test strips that are available to the diabetic and insulin-using subpopulations. This approach allows us to observe potential changes in the availability of test strips that could be induced by the competitive bidding program.

A critical limitation to this claims-based methodology for tracking *availability* is that it falls short of tracking actual *utilization* of test strips. The potential exists for discrepancies between the number of test strips available to a beneficiary and the number of test strips they use. In particular, OIG previously studied billing patterns for diabetic testing supplies, finding high rates of improper billing, including the billing of test strips during Part A-covered inpatient stays and the billing of test strips at precise, regular intervals.<sup>43</sup> Importantly, these findings suggest that many beneficiaries likely received more diabetic test strips than they were able to utilize. OIG’s report further found that competitive bidding reduced improper billing patterns, while other areas saw no such reduction.<sup>44</sup> Another unobservable variable is how well beneficiaries adhere to the blood glucose testing regimen prescribed by their physician. These limitations

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<sup>40</sup> Medicare coverage guidelines allow for annual lab tests for diabetes screening for beneficiaries at risk of developing diabetes. These claims for screening services may include diabetes diagnoses, even though the beneficiary does not yet have diabetes.

<sup>41</sup> Hasche, J., C. Ward, and N. Schluterman. September 2017. *Diabetes Occurrence, Costs, and Access to Care among Medicare Beneficiaries Aged 65 Years and Over*. Centers for Medicare & Medicaid Services.

<sup>42</sup> Sakshaug, J. W., D. R. Weir, and L. H. Nicholas. Identifying Diabetics in Medicare Claims and Survey Data: Implications for Health Services Research. *BMC Health Services Research* 2014, 14:150.

<sup>43</sup> Office of Inspector General, Department of Health and Human Services. August 2013. *Inappropriate and Questionable Medicare Billing for Diabetes Test Strips (OEI-04-11-00330)*. Washington, DC: OIG.

<sup>44</sup> Ibid.

make it clear that, while test strip availability is a useful metric, it can only be viewed as an estimation of test strip usage.

### **Identifying Suitable Control Populations**

The evaluation of a policy change like the NMOP typically provides for a control population which is unaffected by the new policy. The presence of a control population allows researchers to directly observe and measure a critical counterfactual: the effect of not being subject to the new policy. This is of particular importance when studying outcomes in the Medicare population, as health outcome rates often change over time for a variety of reasons. Therefore, the existence of a control population allows us to account for these unrelated factors, and isolate the effect of the policy measure. However, because the NMOP was implemented nationally, and because payment rates for retail DTS were also affected by the program, no clear control group is available. This limitation is ultimately unavoidable and will require the adoption of alternative methods for identifying program-wide trends in health outcome rates that may be unrelated to competitive bidding, though these methods may have limited value.

## 6 FINDINGS

In this chapter, we will present findings from our trend analysis, regression analysis, and cohort analysis, which collectively examine the impact of the NMOP on Medicare service utilization and beneficiary health outcomes.

### 6.1 TREND ANALYSIS

This section presents monthly trends in utilization of diabetic supplies and beneficiary health outcomes, as observed in claims data. These trends shed light on potential impacts of the NMOP without adjusting for beneficiary demographic characteristics or other risk factors, such as comorbidities.

#### 6.1.1 Utilization of Diabetic Supplies

For competitively bid diabetic supplies, we summarized monthly utilization data (e.g., number of users and allowed services) for beneficiaries residing outside the Round 1 CBAs. There was a decline in the number of allowed services and users beginning in 2012 and a further drop in July 2013. For example, for test strips (HCPCS code A4253), total users per month dropped from about 950,000 in 2010 to 900,000 in 2012 and then to 800,000 after July 2013, and remained at this level through the end of 2015. Notably, one month before the NMOP took effect, the number of users for some diabetic testing products (e.g., test strips and lancets) increased drastically, which may be explained by suppliers trying to maximize profit margin before the payment reduction took effect in July 2013, or beneficiaries stocking up on test strips in case they would have trouble finding a new supplier under the NMOP.

While the competitive bidding process was only implemented for mail-order DTS, retail DTS was set to be paid at the same reduced rate as mail-order DTS beginning in July 2013, in order to remove the incentive for suppliers to prefer furnishing retail supplies to mail-order supplies. Interestingly, our analysis shows that mail-order and retail markets have reacted differently to the payment reduction, where mail-order users decreased significantly but retail users increased slightly. This may be a sign of overutilization of mail-order supplies before the NMOP was implemented. As displayed in *Figure 6-1*, mail-order test strip users generally show the same declines in 2012 and 2013 as total test strip users, while the number of retail test strip users increased from about 450,000 per month to 500,000 after July 2013. This increase in retail users could mean that some mail-order users switched to retail. Through further analyses, we found that 10% of beneficiaries who were using exclusively mail-order test strips in the first half of 2013 switched to retail test strips in the second half of the year, while in 2012, the rate was 1%. The increase in retail users, however, is not big enough to compensate for the decline in mail-order users, meaning that some beneficiaries ceased acquiring new test strips after July 2013. Later in July 2016, when the National Mail-Order Recompete (NMORC) took place, the number of beneficiaries using mail-order test strips dropped again, but this time to a much smaller degree as compared to 2013. There was another decline in November 2016, but it was due to some supplier-level changes that were unrelated to the competitive bidding program.<sup>45</sup>

In addition, we analyzed test strip utilization trends for two populations that are particularly in need of glucose testing: diabetics and regular insulin users (both were further stratified by type 1 vs. type 2 diabetics). We calculated two sets of data: monthly average test strips per outpatient day and monthly test strip usage rates. Both of the data sets consider changes in population size. *Figure 6-2* shows the

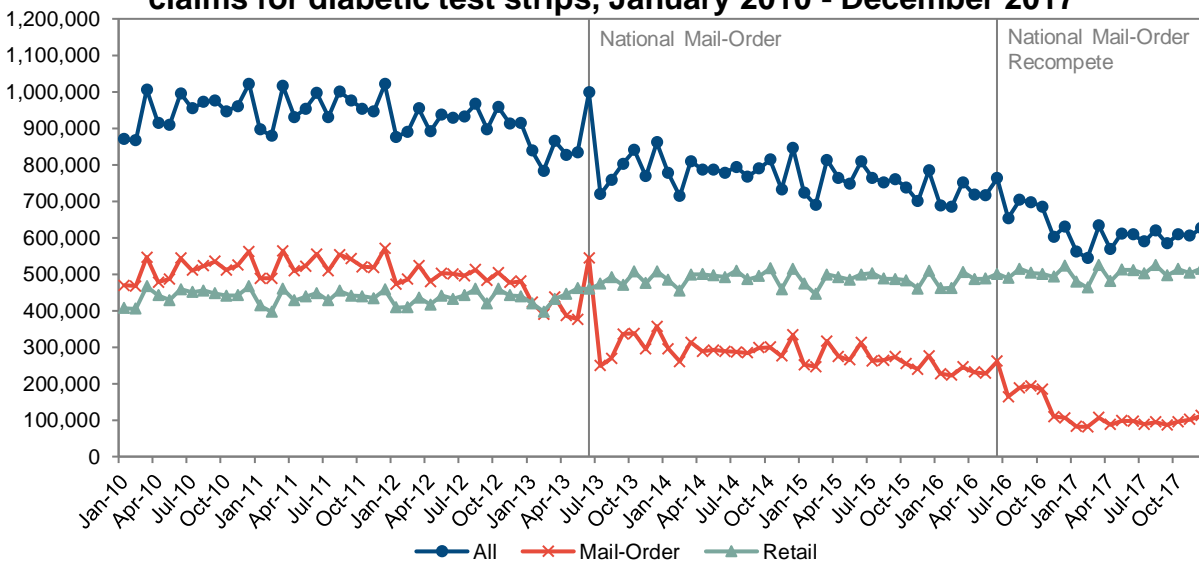
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<sup>45</sup> In Section 3.1, we mentioned that CMS revoked the billing privilege of Arriva Medical, LLC in November 2016 because Arriva filed claims for deceased beneficiaries. Following the revocation, Arriva was no longer able to receive payment from Medicare (although Arriva continued to submit non-allowed claims until its closure in November 2017). Arriva was one of the largest mail-order DTS suppliers in the market, so its revocation in November 2016 resulted in a noticeable dip in the mail-order trend line in *Figure 6-1*. This dip can also be observed in *Figures 6-2* and *6-3*.

average number of test strips (mail-order and retail combined) per outpatient day.<sup>46</sup> In general, insulin users have higher test strip usage numbers than diabetics, because Medicare covers more test strips for insulin users than non-insulin-using diabetics;<sup>47</sup> type 1 patients have higher test strip usage numbers than type 2 patients, because type 1 patients are typically insulin-dependent and need regular testing of glucose to avoid under- or over-dosing insulin. All four groups of beneficiaries saw a decline in test strips received in mid-2013, which is consistent with the trends in test strip user counts presented in *Figure 6-1*. Specifically, from January 2013 to October 2013, average test strips per beneficiary per day dropped by 14% for type 1 diabetics, 16% for type 2 diabetics, 13% for type 1 insulin users, and 16% for type 2 insulin users.

*Figure 6-3* shows the percentage of diabetics and insulin users who received any amount of test strips (mail-order or retail) in the month of observation. The trends are similar to those in average test strips per day. In addition, about 50% of type 1 diabetics and 66% of type 2 diabetics in a given month do not have test strip claims. There are several possible reasons. For example, some beneficiaries may have been institutionalized and obtained test strips from the Part A provider. Some beneficiaries may have been covered by other insurance plans (such as Veterans Health Care) and acquired the supplies outside the Medicare benefit. Some beneficiaries may have failed to adhere to the blood glucose testing regimen prescribed by their physician and did not obtain resupply until their stock depleted, resulting in a gap between test strip claims. Some beneficiaries may have decided not to use test strips on a daily basis, since multiple clinician groups (such as the Society of General Internal Medicine) have suggested that many type 2 diabetics should not be using test strips on a daily basis. Unfortunately, most of these possible explanations are untestable using available data.

**Figure 6-1. Monthly number of beneficiaries who had allowed claims for diabetic test strips, January 2010 - December 2017**

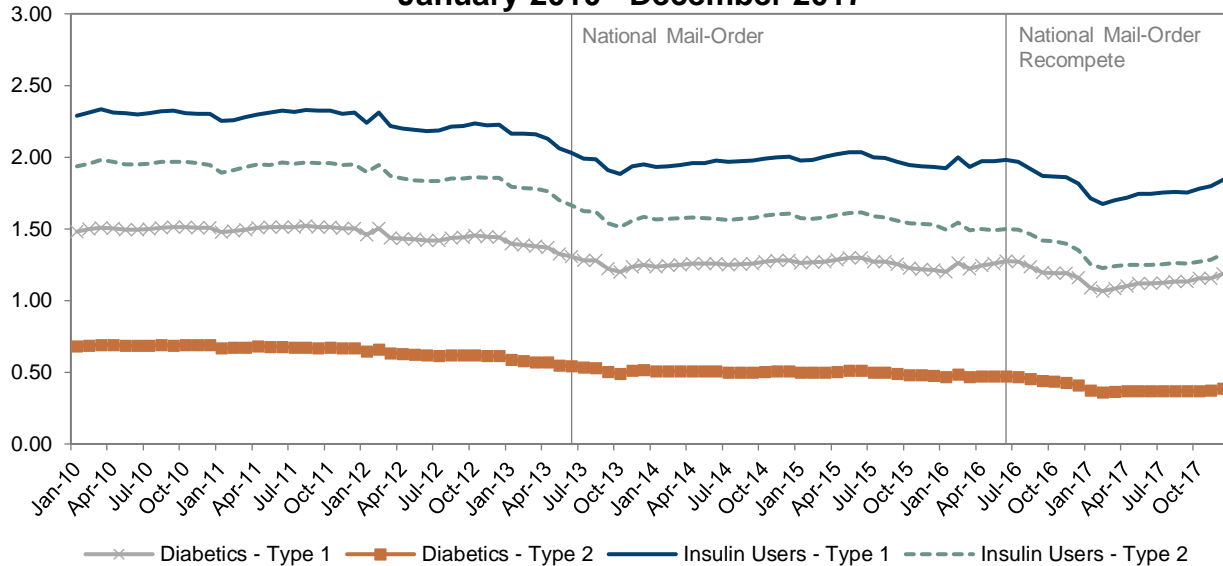


**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

<sup>46</sup> This measure includes beneficiaries who did not use test strips. For detailed methodology, please refer to Section 4.2.

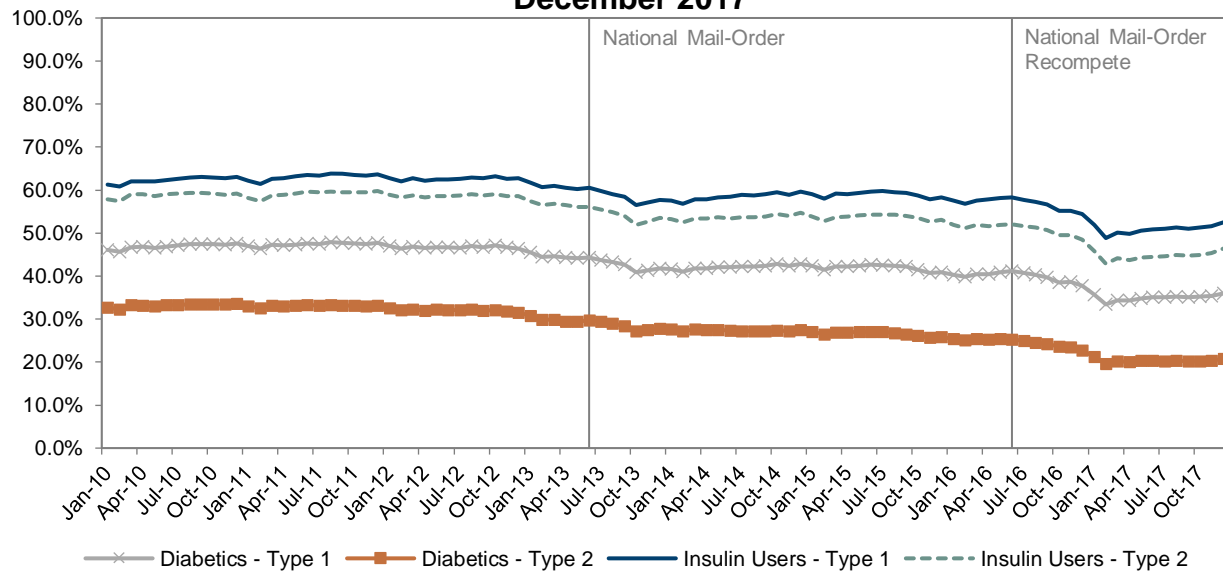
<sup>47</sup> Centers for Medicare and Medicaid Services. "Current Medicare Coverage of Diabetes Supplies." *CMS.gov*, <https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNMattersArticles/Downloads/SE18011.pdf>

**Figure 6-2. Monthly average test strips per outpatient day, January 2010 - December 2017**



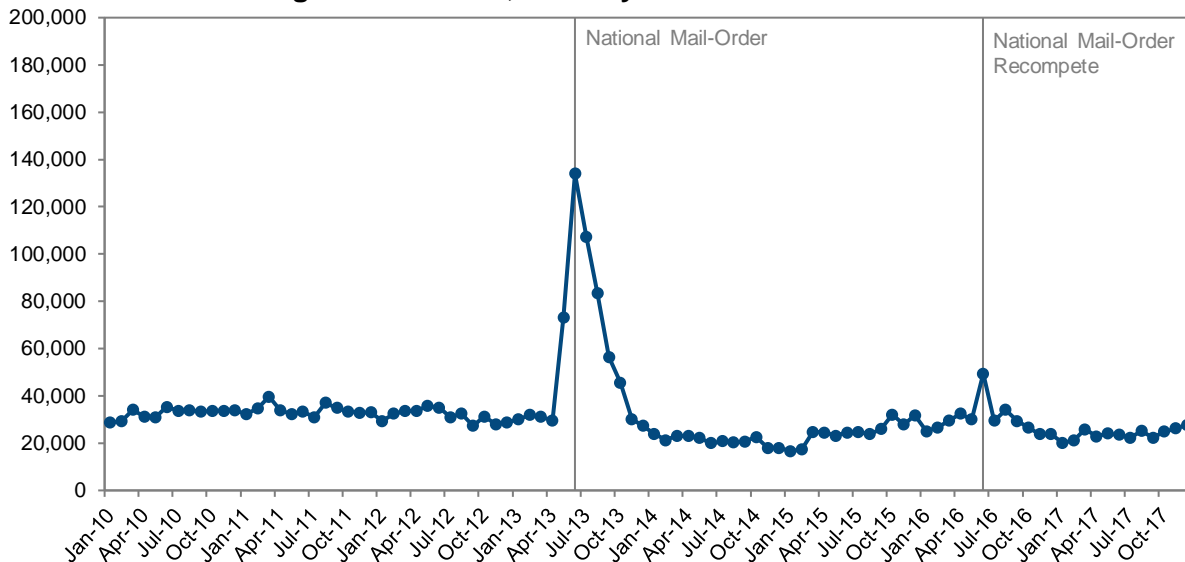
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-3. Monthly test strip usage rate, January 2010 - December 2017**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-4. Monthly number of beneficiaries who had allowed claims for glucose meters, January 2010 - December 2017**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

Further, we examined monthly trends in utilization of glucose meters (HCPCS code E0607). Glucose meters are often recommended to be used with a particular brand of test strips; therefore, if beneficiaries experienced difficulty accessing test strips compatible with the meter they owned, they might purchase a new glucose meter, in which case the volume of glucose meter claims would increase. Interestingly, we did find a sharp increase in the number of glucose meter purchases from May to October 2013 (see *Figure 6-4*).<sup>48</sup> The timing suggests that the trend is highly likely to be related to competitive bidding, so we conducted a separate analysis, which will be discussed later in this chapter, to study whether it is a sign of beneficiaries having trouble obtaining adequate test strips under the competitive bidding program.

**To sum up, the implementation of the NMOP led to a substantial decline in the utilization of mail-order test strips and a modest increase in the utilization of retail test strips. Some mail-order users switched to retail, but a larger number of beneficiaries stopped using DTS entirely (“stoppers”). Additionally, claims for glucose meters increased substantially in the months immediately before and after the start of the NMOP, likely because some beneficiaries needed to switch to another brand of glucose meter and test strips.** We conducted further analyses of these trends and documented our findings in Section 6.3.

### 6.1.2 Beneficiary Health Outcomes

To understand the impact of the NMOP on beneficiary health outcomes, we summarized monthly rates of all-cause mortality, hospitalization, and ER visits,<sup>49</sup> as well as diabetes-related hospitalization and ER visits, among diabetics and regular insulin users (both populations were further stratified by type 1 vs.

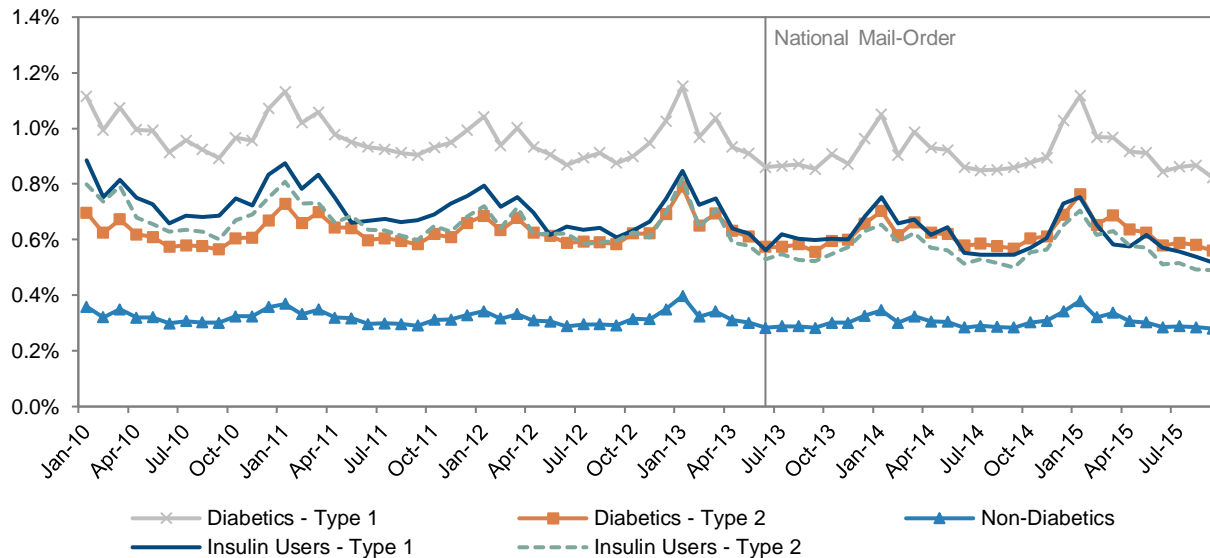
<sup>48</sup> There is another spike from May to July 2016, when the recompete took effect. However, the magnitude of this increase is much smaller compared to 2013, because fewer patients would need to switch supplier from the NMOP to the recompete.

<sup>49</sup> In this analysis, we included both inpatient and outpatient ER claims. However, we also conducted a sensitivity analysis of all-cause ER rates using outpatient claims only and found that while outpatient ER rates increased in all populations, there were no particular changes after the implementation of the NMOP.

type 2 diabetics) residing outside the Round 1 CBAs. For all-cause health outcome rates, we included non-diabetics for comparison. In general, the rates for all populations remain stable from 2010 to 2017, except for some seasonal spikes in winter months. Hospitalization and ER visits for the treatment of diabetic ketoacidosis show a steady increase from 2010 to 2015, with no particular changes after the implementation of the NMOP. For insulin users, there is a slightly declining trend in all-cause mortality, hospitalization, and ER rates, which can possibly be explained by the expansion of the insulin user population due to increasing Part D enrollment and changes in patient composition over the years. Furthermore, type 1 patients are considered more vulnerable than type 2 patients, and they do show higher adverse health outcome rates than type 2 patients. The trends discussed in this section are presented in *Figures 6-5 through 6-11*.<sup>50</sup>

In addition, we summarized Medicare spending per capita for diabetics and insulin users to measure potential cost-shift effects of the competitive bidding program. As shown in *Figure 6-12*, apart from some seasonal dips in winter months, per capita spending has remained stable for diabetics and insulin users.<sup>51</sup>

**Figure 6-5. Monthly all-cause mortality rates in diabetics and insulin users, January 2010 - September 2015**



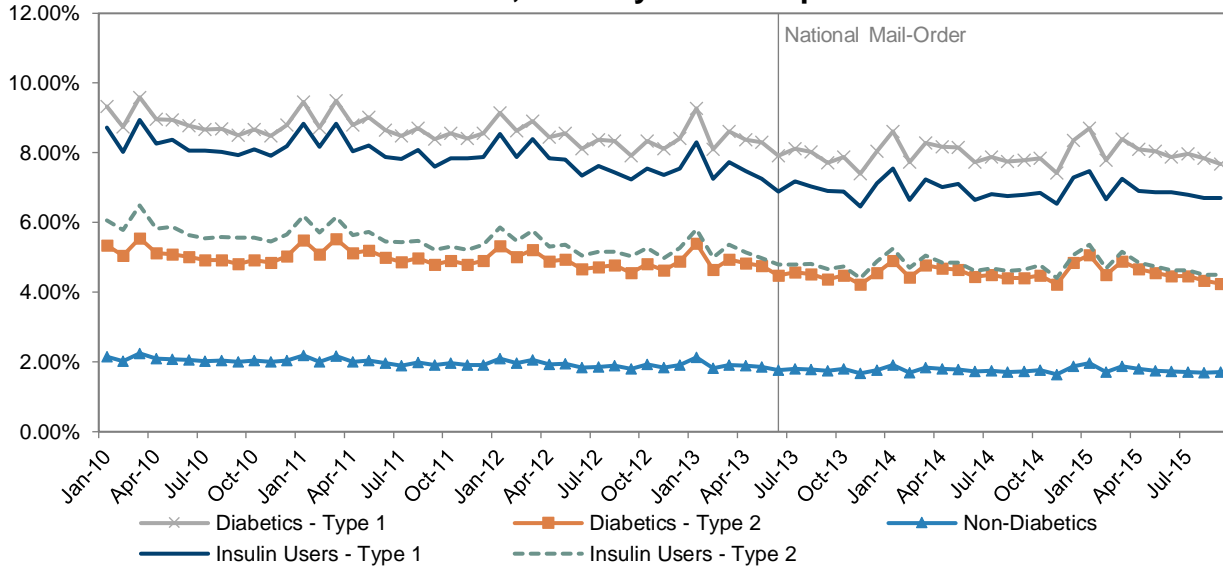
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

<sup>50</sup> We also computed the rates of outpatient hospital observation use for all populations. There has been a gradual increase in the use of outpatient observation services, but we did not find any particular increase after the NMOP was implemented in July 2013.

<sup>51</sup> In addition to Part D insulin users, there are insulin pump users who are captured via Part B claims. Because the Part B population is much smaller and displays different patterns of health care use compared to Part D insulin users, we examined their health outcomes separately. We did not find any increase in mortality rates, hospitalization rates, ER use, outpatient observation use, or total Medicare Parts A and B spending per capita for Part B insulin users after the NMOP was implemented in July 2013.

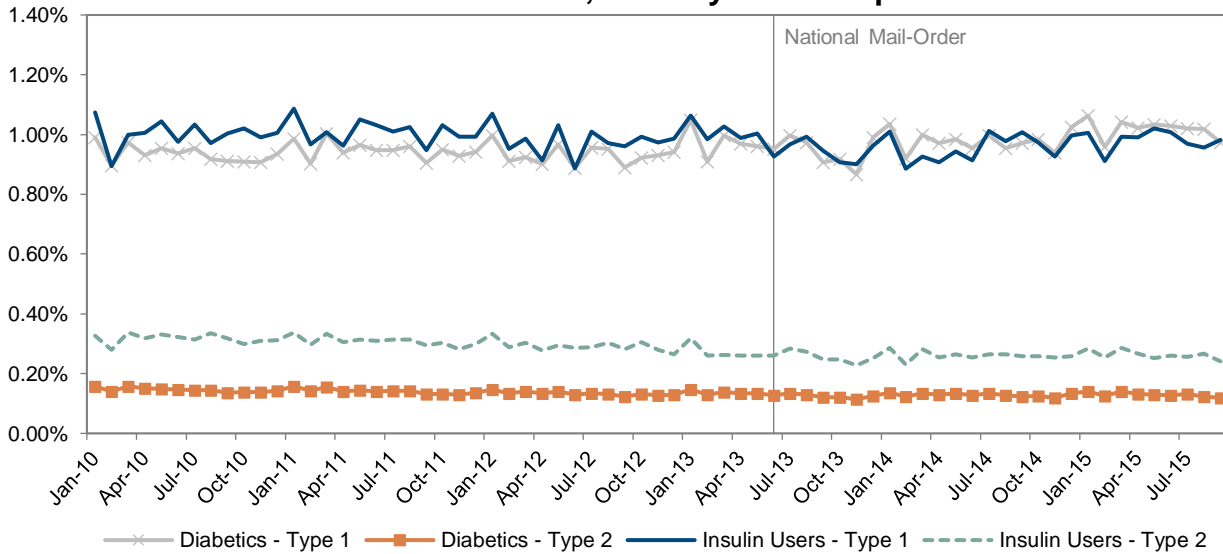


**Figure 6-6. Monthly all-cause hospitalization rates in diabetics and insulin users, January 2010 - September 2015**



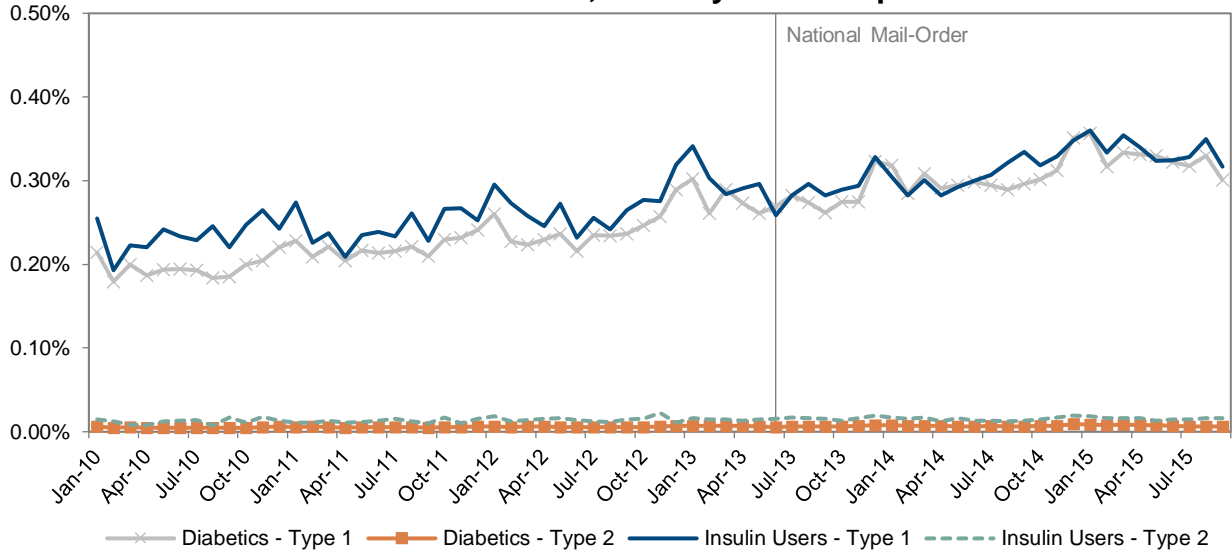
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-7. Monthly diabetes-related hospitalization rates in diabetics and insulin users, January 2010 - September 2015**



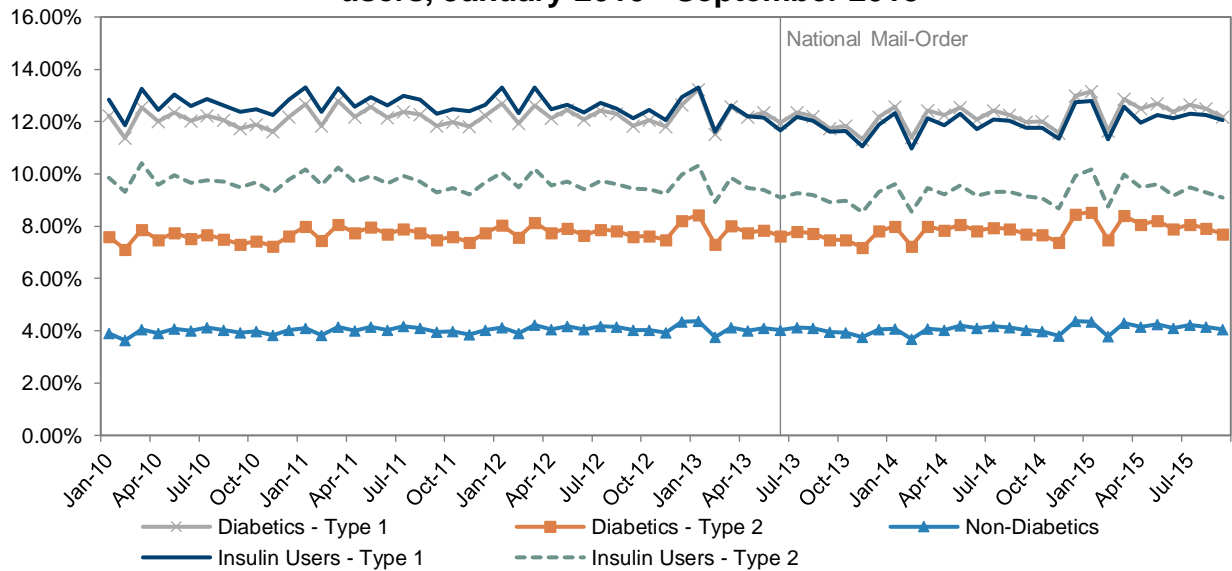
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-8. Monthly ketoacidosis-related hospitalization rates in diabetics and insulin users, January 2010 - September 2015**



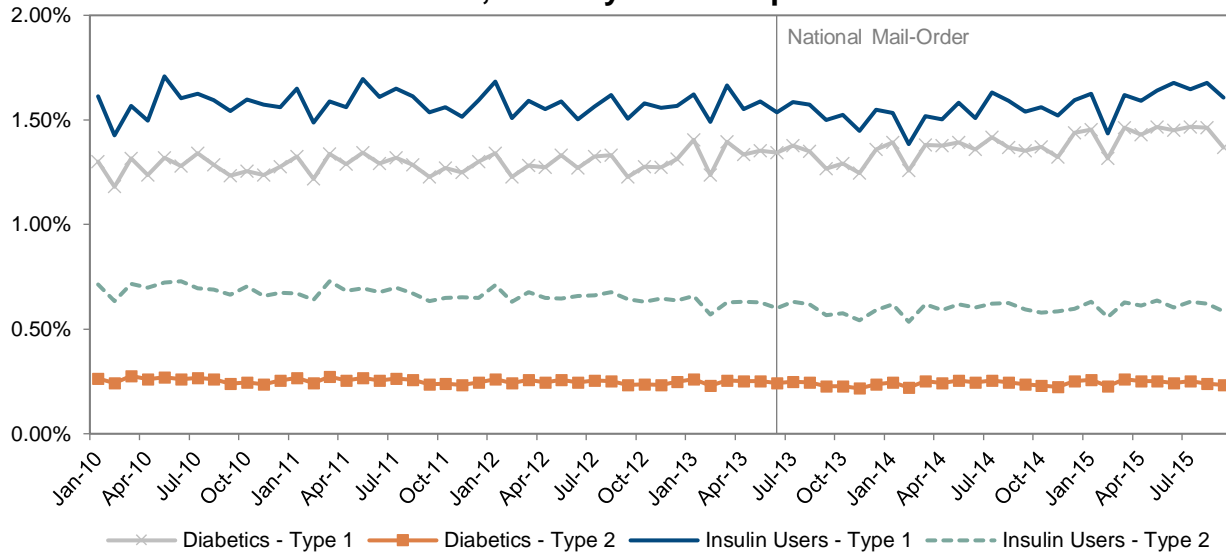
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-9. Monthly all-cause ER rates in diabetics and insulin users, January 2010 - September 2015**



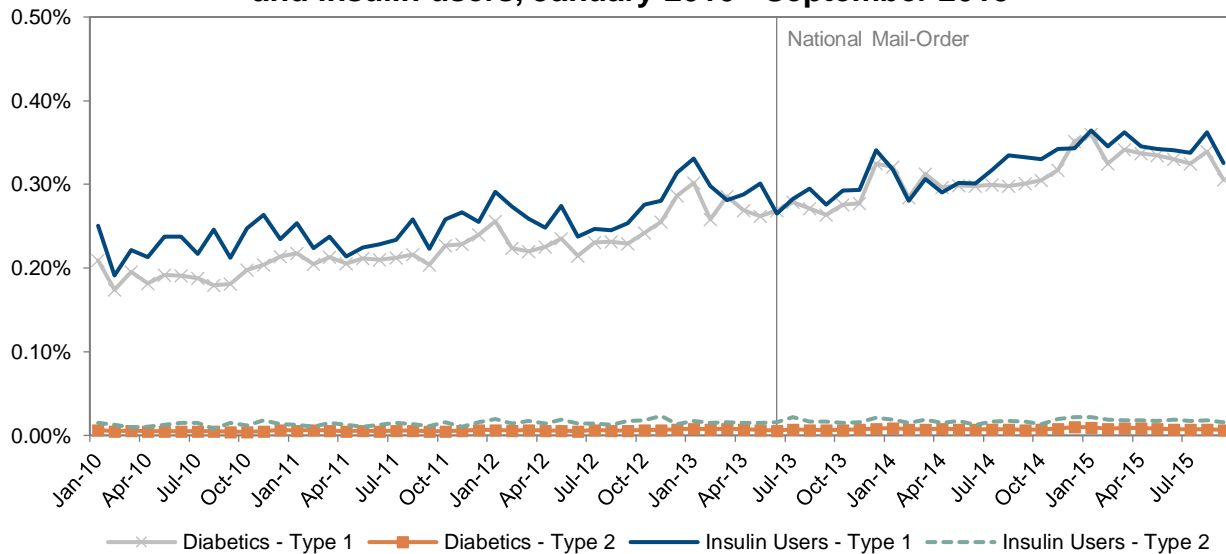
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-10. Monthly diabetes-related ER rates in diabetics and insulin users, January 2010 - September 2015**



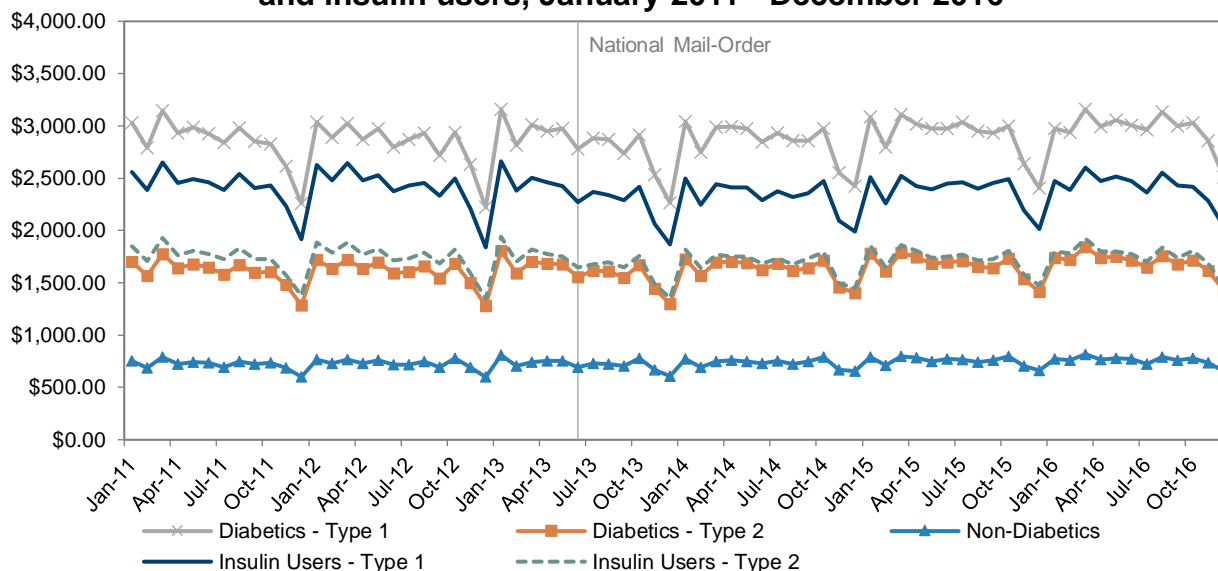
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-11. Monthly ketoacidosis-related ER rates in diabetics and insulin users, January 2010 - September 2015**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**Figure 6-12. Monthly Medicare spending per capita for diabetics and insulin users, January 2011 - December 2016**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A and B in the month of observation.

**In conclusion, we did not find any evidence that the implementation of the NMOP led to elevated rates of adverse health outcomes.** However, the possibility remains that there are underlying factors, such as patient demographics, that may have changed over time and affected the results. Therefore, we conducted a regression analysis and will discuss findings in the next section.

## 6.2 REGRESSION ANALYSIS

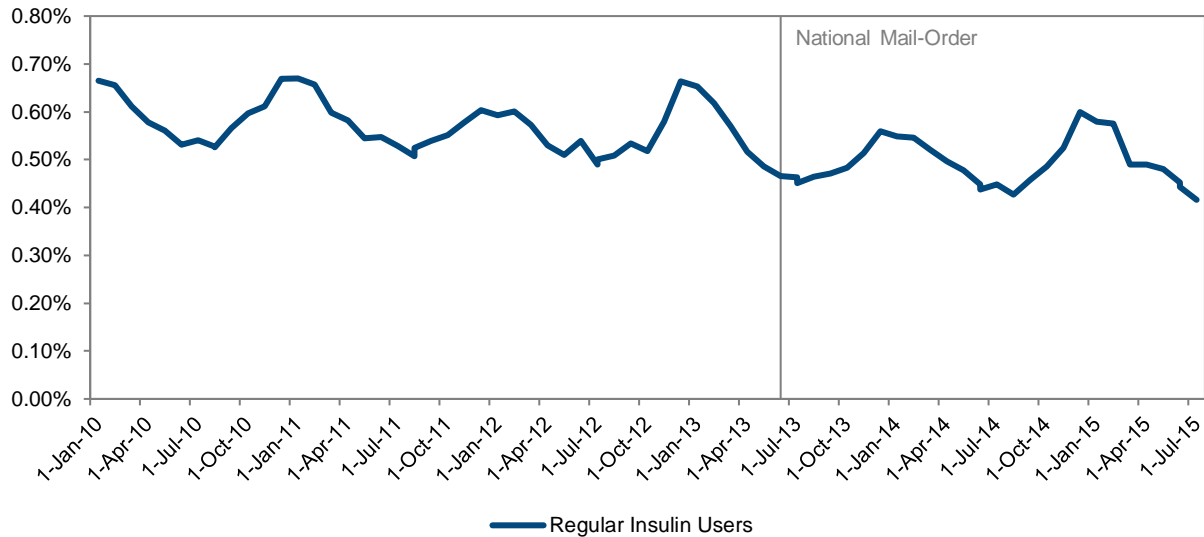
This section presents the results of our baseline regression model, including graphs of our expected outcome rates over time for both the regular insulin users and the comparison group. Similar to the unadjusted trend analysis discussed in Section 6.1, these trends shed light on potential impacts of the NMOP but now adjust for changes in beneficiary demographic characteristics. In addition to the baseline model specifications discussed in Section 4.3, we include results of a follow-up investigation to better explain the trends we observe in adverse health outcomes.

### 6.2.1 Regression Analysis for Regular Insulin Users

We first performed the logit regression specification for the regular insulin user population, defined over a series of 73 four-week periods. The first four-week period starts on January 18, 2010 and the final period starts on July 27, 2015. For each four-week period we defined a regular insulin user population meeting the enrollment and insulin criteria as of the first day of that period. We then measured the occurrence of adverse health outcomes over the course of each four-week period (e.g., for the first period we measure adverse health outcomes occurring from January 18, 2010 to February 14, 2010). *Tables F-1 through F-3* in Appendix F detail the results of these regressions for the regular insulin population, including estimates of the odds ratio, standard error, p-values, and 95-percent confidence intervals for each model covariate. Having completed this regression specification, we performed the post-regression analysis described in Section 4.3, allowing us to measure the average estimated probability for our adverse health outcomes

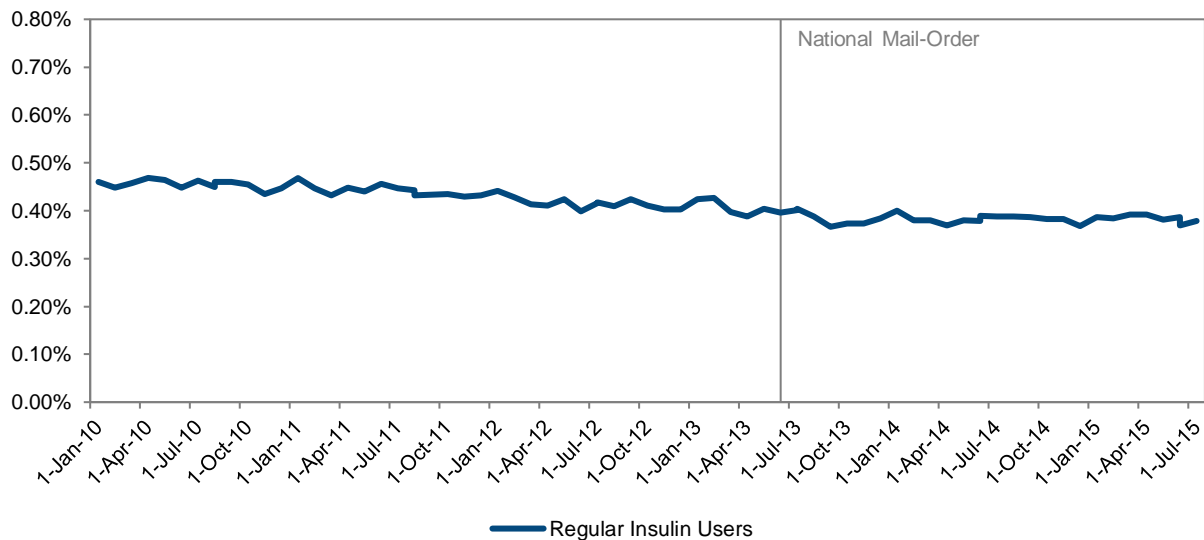
over time, holding our population constant. Figures 6-13 through 6-15 below display these results graphically, allowing us to visualize the demographic-adjusted time trends for each adverse health outcome.

**Figure 6-13. Average expected mortality rates for regular insulin users, January 2010 - August 2015**



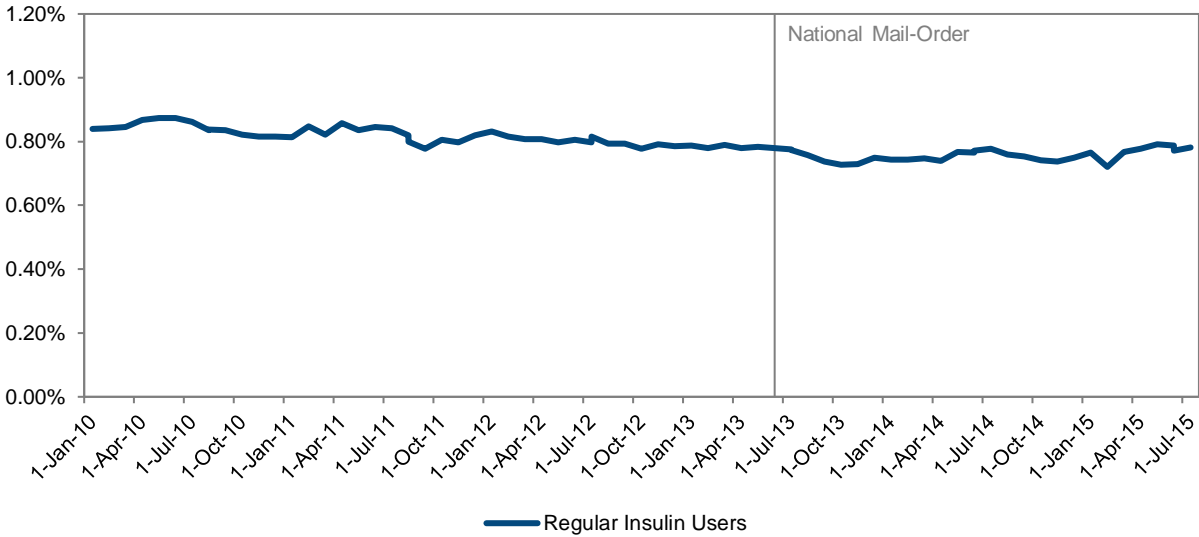
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-14. Average expected diabetes-related hospitalization rates for regular insulin users, January 2010 - August 2015**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-15. Average expected diabetes-related ER rates for regular insulin users, January 2010 - August 2015**



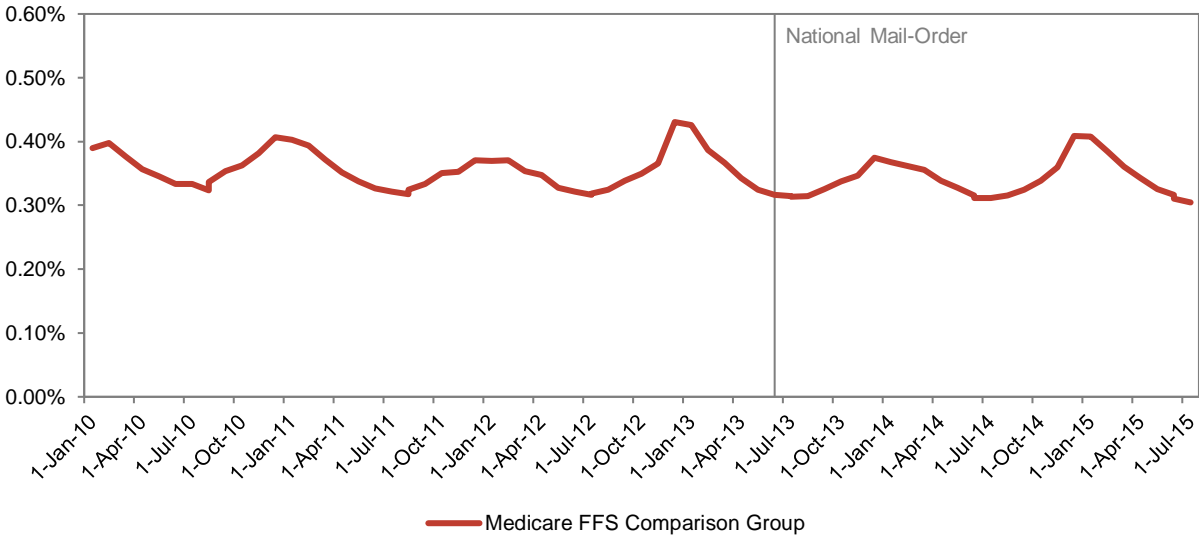
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

These post-regression results are useful in that they allow us to assess how expected outcome rates change over time, controlling for demographic characteristics by holding our study population constant. Because the post-regression analysis also measures the differential effect of each time period on the expected outcome rate, we would be able to observe the impact of the NMOP as a change in outcome rates beginning after July 1, 2013, which is denoted with a vertical line in each chart. **However, the results of our post-regression analysis illustrate that the introduction of the NMOP did not lead to poorer health outcomes. Our post-regression results are very similar to the unadjusted rates discussed in Section 6.1, suggesting that the effects of changes in the demographic composition of the regular insulin users over time are not significant.**

### 6.2.2 Regression Analysis for the Comparison Group

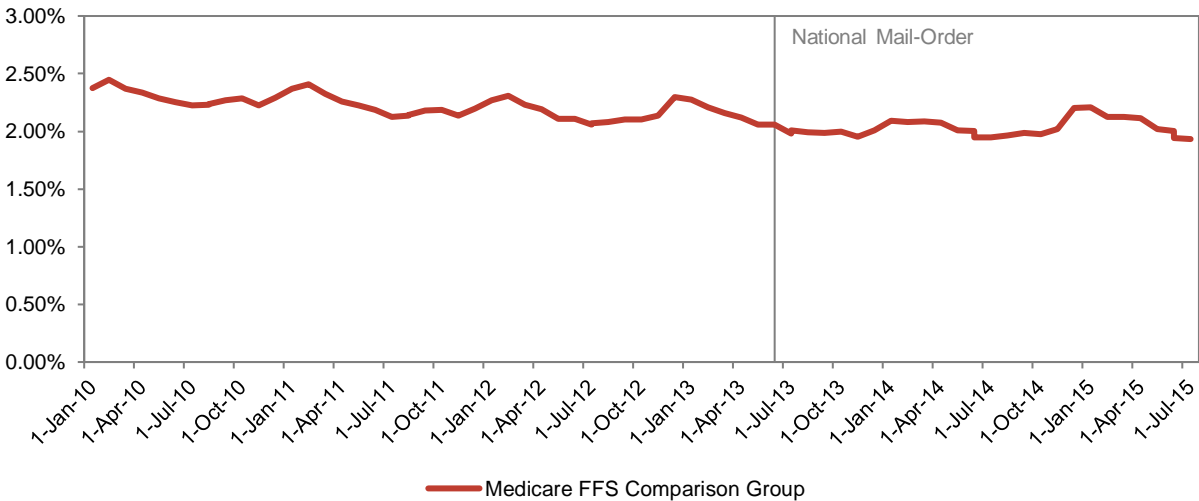
As discussed in Section 4.3, we also conducted a regression analysis on FFS beneficiaries who were not diabetics or insulin users to better contextualize and understand the results observed for the regular insulin users. Within this population, we performed the same regression and post-regression specifications for the following adverse health outcomes: mortality, non-diabetes-related hospitalization, and non-diabetes-related ER. *Figures 6-16 through 6-18* below display these results graphically, allowing us to visualize the demographic-adjusted time trends for each adverse health outcome.

**Figure 6-16. Average expected mortality rates for comparison group, January 2010 - August 2015**



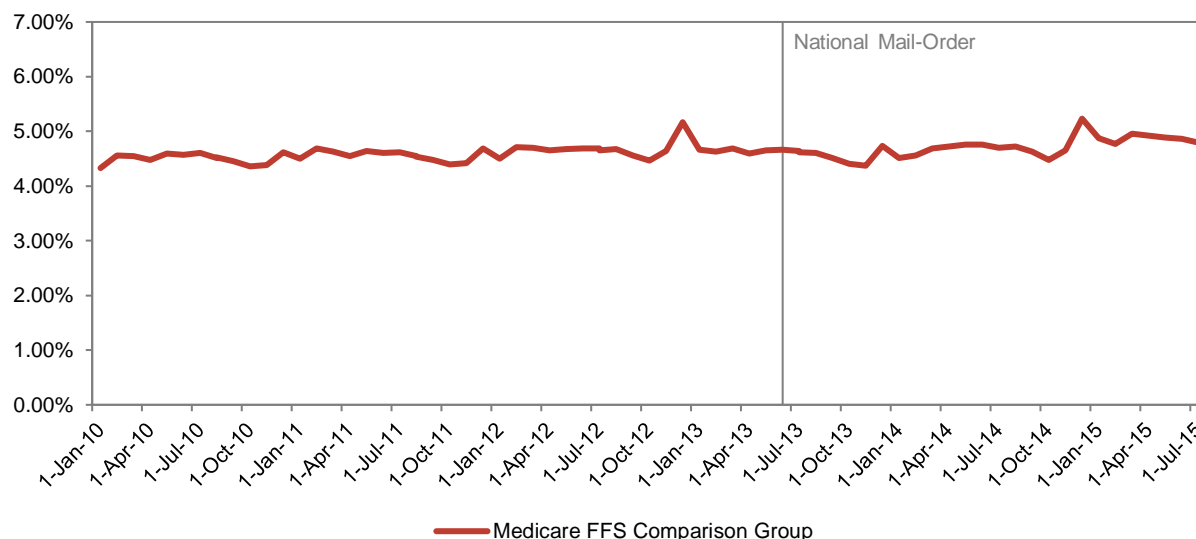
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-17. Average expected non-diabetes-related hospitalization rates for comparison group, January 2010 - August 2015**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-18. Average expected non-diabetes-related ER rates for comparison group, January 2010 - August 2015**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

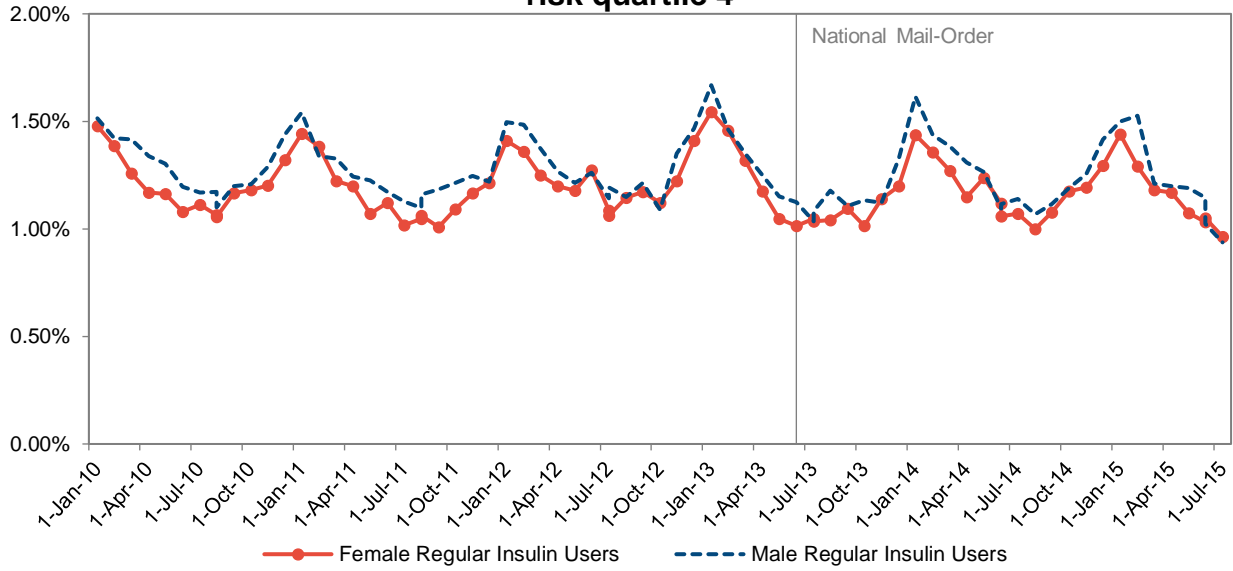
The results of the post-regression analysis for the comparison group, interestingly, demonstrate slightly different trends than what was observed for the regular insulin users. For mortality and non-diabetes-related ER rates, we observe, respectively, steady and slightly increasing trends. Meanwhile, we do observe a slight decline in the non-diabetes-related hospitalization rates.

### 6.2.3 Additional Analysis of Health Outcomes for Regular Insulin Users

In light of the findings of our regression analyses, we performed additional analyses to better understand the underlying causes of the unique trends in adverse health outcomes for this group. First, we stratified outcome rates within the regular insulin user group by demographic characteristics. Second, we added information about each beneficiary’s health status by incorporating their CMS-HCC community risk score, which is calculated at the beginning of each calendar year. CMS officially uses its risk score methodology to predict payment rates for MA enrollees, with lower risk scores indicating better health status and higher risk scores indicating poorer health status. For each period, we took the beneficiary’s risk score for the same calendar year. For example, we used 2010 risk score data for all beneficiaries in our 2010 study periods. Having assigned risk score data in this way, we measured the overall distribution of risk scores in our insulin user group and divided observations in our study to one of four risk quartiles, with the first quartile having the lowest risk scores and the fourth quartile having the highest risk scores. Further, because quartile definitions are calculated once for the entire study, the definition of each quartile remains the same over the course of our study timeline. Finally, we combined demographic and risk quartile stratifications to measure unadjusted outcome rates for mortality, diabetes-related hospitalizations, and diabetes-related ER visits. *Figures 6-19 through 6-22* display results for the mortality component of this analysis.

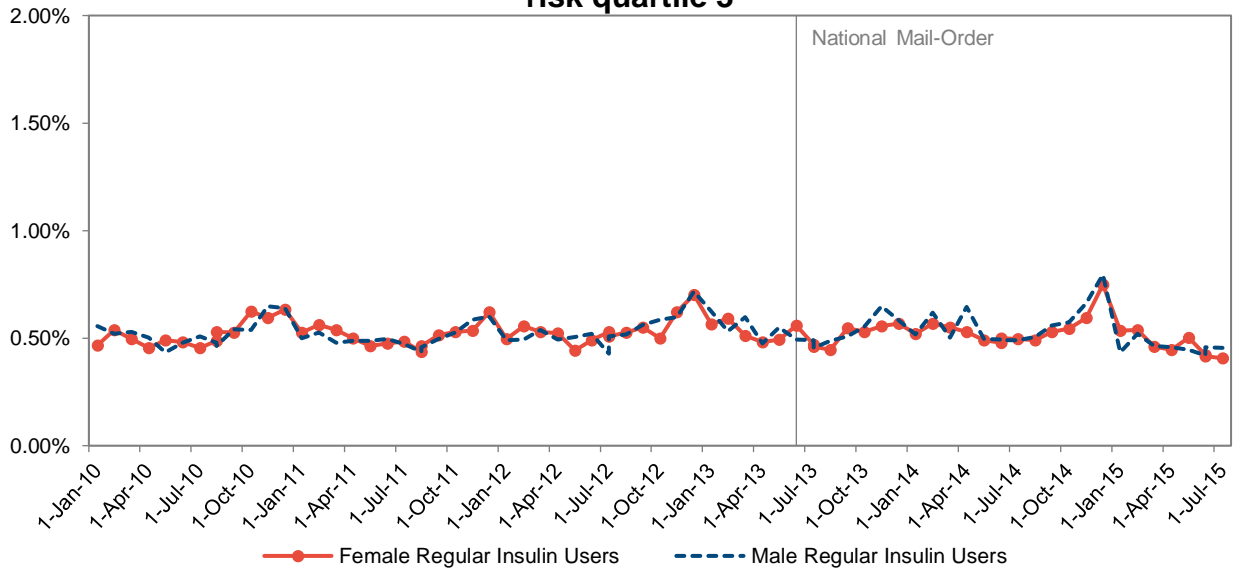


**Figure 6-19. Mortality rates by gender for regular insulin users in risk quartile 4**



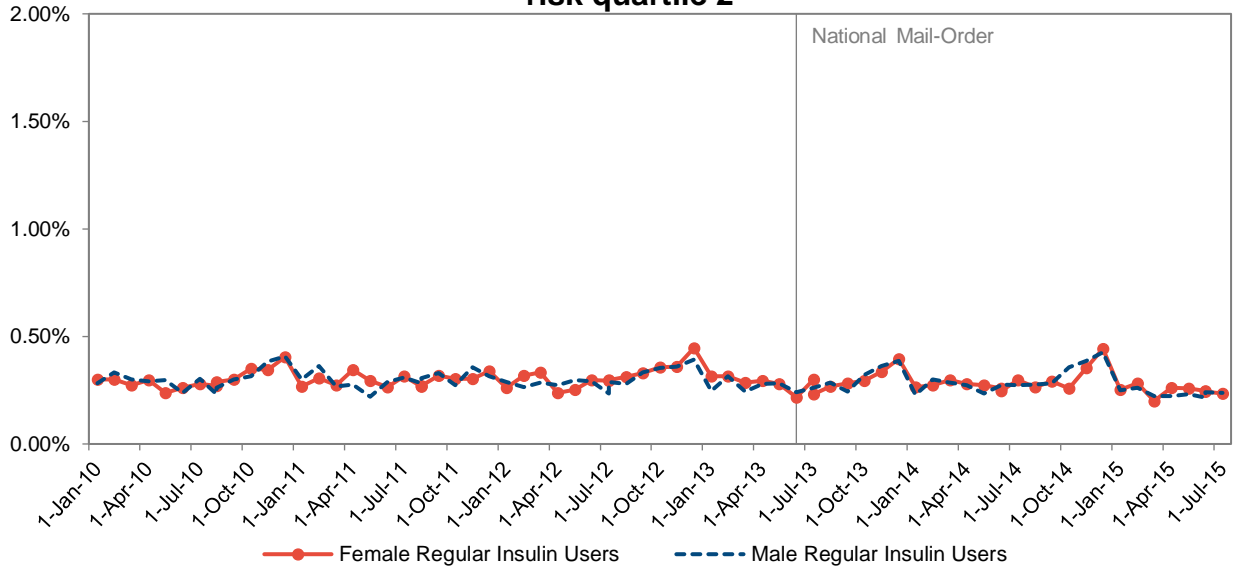
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-20. Mortality rates by gender for regular insulin users in risk quartile 3**



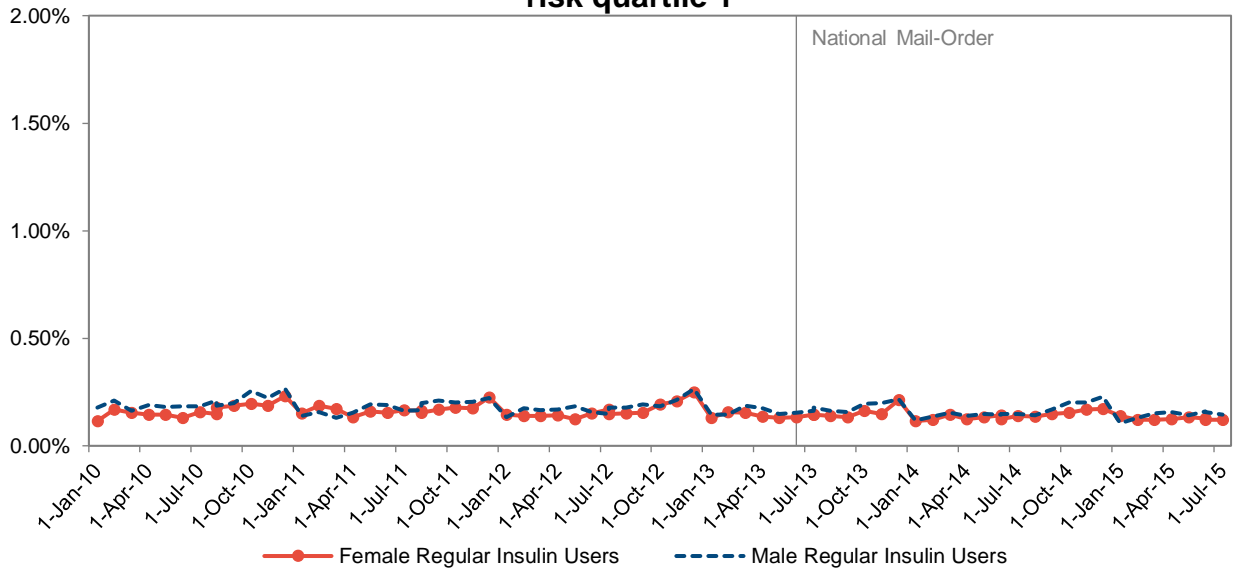
**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-21. Mortality rates by gender for regular insulin users in risk quartile 2**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

**Figure 6-22. Mortality rates by gender for regular insulin users in risk quartile 1**



**Study population:** Beneficiaries residing outside Round 1 Rebid CBAs and enrolled in Medicare Parts A, B and D in the four-week period.

These figures for mortality rates highlight an interesting finding that mortality rates are primarily declining in the first risk quartile group for both male and female regular insulin users. Meanwhile, mortality rates are predominantly stable for the other risk quartiles over the course of the study window. **This result suggests that the observation of declining mortality rates in aggregate is largely explained by improving health status among regular insulin users in the healthiest risk quartile. These findings also extend to the other adverse health outcomes.**

### 6.3 COHORT ANALYSIS

As mentioned in Section 6.1, we found that some beneficiaries stopped receiving test strips after the implementation of the NMOP, and that many beneficiaries obtained a new glucose meter when the NMOP started. To better understand these two trends, we conducted a separate analysis of these two cohorts.

#### 6.3.1 Beneficiaries who Stopped Receiving Test Strips

We began by transforming the monthly test strip utilization and health outcome data into a cross-sectional table where we identify all test strip users at three separate points in time (June 2012, June 2013, and June 2014) and track their utilization of test strips and health outcomes in the next six months. For utilization, we computed the percentage of test strip users who were “stoppers” (beneficiaries who did not have an allowed test strip claim during July-December) and those who were “non-stoppers” (beneficiaries who had an allowed test strip claim during July-December). For health outcomes, we calculated mortality, hospitalization, and ER visit rates. *Table 6-1* summarizes the results.

**Table 6-1. Health outcomes in July-December 2012, 2013, and 2014 among test strip users (stoppers and non-stoppers combined)**

Month	Number of test strip users	Mortality rate	ER rate	Hospitalization rate	Share who are stoppers	Share who are non-stoppers
June 2012	916,143	2.6%	33.1%	19.8%	14.1%	85.9%
June 2013	984,808	2.6%	32.6%	18.9%	22.0%	78.0%
June 2014	764,475	2.6%	32.3%	18.4%	14.5%	85.5%

Note: Mortality, ER, and hospitalization rates measure the percentages of test strip users in June 2012, 2013, and 2014 who experienced death, an ER visit, or a hospitalization from July to December. These measures do not account for the number of visits.

Test strip user counts in *Table 6-1* are consistent with those in *Figure 6-1*,<sup>52</sup> where 2013 is higher than 2012, and 2014 is much lower than the other two years. Mortality, hospitalization, and ER rates are similar across the three years, with a slight decline from 2012 to 2014. The percentage of stoppers, however, is much higher in 2013, which is consistent with our finding from the trend analysis that utilization of test strips dropped substantially after the implementation of the NMOP in mid-2013.

<sup>52</sup> The numbers in *Table 6-1* are slightly lower because we required the beneficiaries to be continuously enrolled in Medicare Parts A and B (and not in an MA plan) from June through December for each year. This enrollment requirement helps us identify “stoppers” and their health outcomes more accurately.

Next, we analyzed health outcomes among stoppers and non-stoppers separately. As shown in *Table 6-2*, stoppers' mortality, ER, and hospitalization rates and inpatient spending per capita<sup>53</sup> during July-December are lower in 2013. In the meantime, non-stoppers show similar trends in health outcomes as total test strip users, where the rates gradually declined.

**Table 6-2. Health outcomes in July-December 2012, 2013, and 2014 among test strip users (stoppers and non-stoppers separated)**

Month	Number of stoppers	Mortality rate	ER rate	Hospitalization rate	Inpatient spending per capita
June 2012	129,032	9.4%	36.3%	25.1%	\$ 4,312.43
June 2013	216,493	6.8%	35.5%	22.7%	\$ 3,914.12
June 2014	110,986	9.1%	36.5%	24.0%	\$ 4,241.46
Month	Number of non-stoppers	Mortality rate	ER rate	Hospitalization rate	Inpatient spending per capita
June 2012	787,111	1.5%	32.6%	19.0%	\$ 2,604.77
June 2013	768,315	1.4%	31.8%	17.8%	\$ 2,432.32
June 2014	653,489	1.4%	31.5%	17.4%	\$ 2,429.72

Note: Mortality, ER, and hospitalization rates were calculated in the same manner as described in Table 6-1. For inpatient spending per capita, we identified all inpatient claims for stoppers and non-stoppers in each year and calculated spending per capita for July-December of the year. For stoppers' health outcome rates, we performed unequal variance t-tests for pairwise rate differences between 2013 and the other two years and chi-squared tests for rate differences across the three years, and they all showed p-values smaller than 0.01.

We took the same approach to analyze health outcomes among beneficiaries who were regular insulin users (as defined in Section 4.1) and had an allowed test strip claim at the three time points of interest (June of 2012, 2013, and 2014). The rest of the analysis followed the same steps as described in the previous paragraphs. From *Tables 6-3* and *6-4*, we can draw the same conclusion that there were more beneficiaries who stopped using test strips in 2013 than in 2012 and 2014, and that stoppers in 2013 had better health outcomes than their peers in 2012 and 2014.

**Table 6-3. Health outcomes in July-December 2012, 2013, and 2014 among test strip users who were regular insulin users in June (stoppers and non-stoppers combined)**

Month	Number of test strip users who were regular insulin users	Mortality rate	ER rate	Hospitalization rate	Share who are stoppers	Share who are non-stoppers
June 2012	104,786	3.0%	41.5%	25.6%	7.4%	92.6%
June 2013	124,497	2.8%	40.2%	24.0%	14.4%	85.6%
June 2014	108,236	2.9%	39.6%	23.0%	8.4%	91.6%

<sup>53</sup> We chose to evaluate the potential effect of NMOP on inpatient cost, since some other studies have also discussed this topic. For example, the study by Puckrein et al. found that the migration from full test strip access to partial/no test strip access was associated with higher inpatient costs in policy-affected areas (nine Round 1 CBAs) than baseline areas (remainder of the country).

**Table 6-4. Health outcomes in July-December 2012, 2013, and 2014 among test strip users who were regular insulin users in June (stoppers and non-stoppers separated)**

Month	Number of stoppers	Mortality rate	ER rate	Hospitalization rate	Inpatient spending per capita
June 2012	7,757	17.2%	49.3%	37.0%	\$ 7,680.35
June 2013	17,915	9.8%	45.4%	30.8%	\$ 5,994.84
June 2014	9,142	14.7%	47.5%	33.2%	\$ 6,749.98

Month	Number of non-stoppers	Mortality rate	ER rate	Hospitalization rate	Inpatient spending per capita
June 2012	97,029	1.8%	40.9%	24.7%	\$ 3,539.59
June 2013	106,582	1.7%	39.3%	22.9%	\$ 3,346.03
June 2014	99,094	1.8%	38.9%	22.1%	\$ 3,286.99

Note: For stoppers' health outcome rates, we performed unequal variance t-tests for pairwise rate differences between 2013 and the other two years and chi-squared tests for rate differences across the three years, and they all showed p-values smaller than 0.01.

**In conclusion, the number of beneficiaries who stopped receiving test strips (“stoppers”) increased in mid-2013, but this increase was not associated with increases in negative health outcomes, even for beneficiaries who are likely more susceptible to disruptions in the supply of test strips (i.e., regular insulin users). While stoppers generally had worse health outcomes than non-stoppers, the rates of adverse health outcomes were lower among stoppers in 2013 than those among stoppers in 2012 and 2014 (the difference is statistically significant with p-values smaller than 0.01). This suggests that many of the 2013 stoppers may not have needed to use test strips and that their use of test strips before the NMOP could have been inappropriate.<sup>54</sup>**

In addition, we analyzed demographic characteristics of all beneficiaries who stopped using test strips in June 2012, 2013, and 2014 to examine whether the population composition has changed. **As exhibited in Table 6-5, relative to stoppers in 2012 and 2014, stoppers in 2013 were more likely to be female, African American or Hispanic, under 64 years old, dual eligible, and residents in urban areas, though these demographic differences are small. In addition, the breakdown of test strip usage patterns for the three groups of stoppers suggests that 2013 stoppers were more likely to receive test strips via mail-order. Finally, across the three years, about 18% of the stoppers do not meet the definition of type 1 or type 2 diabetics for June, and more than 90% of the stoppers do not meet the definition of regular insulin users for June.**

<sup>54</sup> To address the fact that some beneficiaries stopped using test strips because they died, we re-ran the analysis and required beneficiaries to be alive during the entire year (i.e., 2012, 2013, or 2014). We found similar results.

**Table 6-5. Characteristics of test strip stoppers in 2012, 2013, and 2014**

Characteristic	2012	2013	2014
<b>Total number of stoppers in June</b>	<b>129,032</b>	<b>216,493</b>	<b>110,986</b>
<b>Type of last test strip claim in June</b>			
Mail-order	49.5%	59.1%	27.5%
Retail	50.5%	40.9%	72.5%
<b>Gender</b>			
Male	44.7%	43.0%	44.9%
Female	55.3%	57.0%	55.1%
<b>Race</b>			
White	78.8%	74.8%	79.6%
African American	14.0%	16.5%	12.4%
Asian	2.1%	2.2%	2.3%
Native American	0.4%	0.4%	0.4%
Hispanic	2.7%	3.9%	2.9%
Other	1.6%	1.7%	1.8%
Unknown	0.3%	0.4%	0.7%
<b>Age</b>			
<65	19.5%	20.4%	19.0%
65-74	40.8%	40.1%	41.7%
75-84	29.1%	29.3%	28.7%
85+	10.6%	10.2%	10.7%
<b>Residence</b>			
Urban	94.1%	94.7%	92.8%
Rural	5.9%	5.3%	7.2%
<b>Dual status</b>			
Dual	32.0%	35.7%	33.6%
Non-Dual	68.0%	64.3%	66.4%
<b>Type of diabetes</b>			
Type 1 diabetics	9.8%	10.2%	9.3%
Type 2 diabetics	71.6%	71.6%	73.5%
Non-diabetics	18.6%	18.2%	17.3%
<b>Insulin use</b>			
Regular insulin users	6.0%	8.3%	8.2%
Non-regular-insulin-users	94.0%	91.7%	91.8%

Note: All information is as of June of each year. Gender, race, age, and dual status are from Medicare Enrollment Data Base. Residence is defined by beneficiary zip code listed on the last test strip claim in June of each year. "Urban" indicates beneficiaries living in metropolitan and micropolitan statistical areas (collectively referred to as the core-based statistical areas, or CBSAs). "Rural" indicates beneficiaries living outside CBSAs. "Dual" indicates beneficiaries having any Medicaid coverage. For type of diabetes and insulin use, we checked whether the stopper meets the definition of "Type 1 Diabetics", "Type 2 Diabetics", or "Regular Insulin Users", as outlined in Section 4.1, for June.

Finally, we analyzed the trends of test strip stoppers at the supplier level to find out if the increase in stoppers in 2013 was driven by certain suppliers. In *Table 6-6*, we selected 10 suppliers with the biggest increase in the number of stoppers from 2012 to 2013. Together, they contributed to 64% of the increase in stoppers from 2012 to 2013 and are also responsible for roughly one-third of total stoppers in 2013. Among them, six are located in MSAs that are identified by OIG as having the highest number of suppliers with questionable billing of test strips in 2011,<sup>55</sup> with four located in Miami-Fort Lauderdale-Pompano Beach, FL MSA alone.

**Table 6-6. Top 10 test strip suppliers with the biggest increase in the number of stoppers from 2012 to 2013**

Supplier rank	Total test strip users in June 2012	Total test strip users in June 2013	Number of stoppers in 2012	Number of stoppers in 2013	Stoppers 2012-2013 change	Share of national change	City	State	Bid winner as of July 2013
National (excl. Round 1 CBAs)	916,143	984,808	129,032	216,493	87,461	100.0%	-	-	-
1	17,892	27,441	1,220	11,684	10,464	12.3%	Boca Raton	FL	N
2	35,363	137,778	5,436	15,600	10,164	12.0%	Coral Springs	FL	Y
3	20,597	81,181	1,020	9,493	8,473	10.0%	Milford	NJ	N
4	4,798	12,583	498	7,837	7,339	8.6%	Carlsbad	CA	N
5	1,706	5,524	243	4,156	3,913	4.6%	Oxford	MS	N
6	13,766	13,519	2,318	6,163	3,845	4.5%	Tempe	AZ	N
7	7,118	8,049	484	3,410	2,926	3.4%	Miami	FL	N
8	4,998	5,529	543	3,065	2,522	3.0%	Milford	MA	N
9	1,757	5,274	225	2,703	2,478	2.9%	Hernando	MS	N
10	19,552	36,618	2,269	4,739	2,470	2.9%	Doral	FL	Y

Additionally, we examined the top 10 suppliers' churn rate (i.e., share of stoppers out of the supplier's total test strip users) and found a steep increase among those that did not win a contract under the NMOP (see *Table 6-7*). Some even saw an increase from about 10% in 2012 to 60%-75% in 2013, while the national average in 2013 is only 22%. On the contrary, the two NMOP contract suppliers show a decrease or a small increase in churn rate from 2012 to 2013, and their rates in both years are similar to or lower than the national averages. We scanned through the data of all suppliers and found that the difference between contract and non-contract suppliers holds true: churn rates among contract suppliers are on average 13% in both 2012 and 2013, whereas non-contract suppliers' average churn rate increased from 17% in 2012 to 39% in 2013. **These supplier-level analyses suggest that the increase in test strip stoppers in 2013 is highly concentrated in certain suppliers, and the increase is more pronounced in non-contract suppliers than contract suppliers. Furthermore, given the broad access to retail test strip suppliers (detailed in section 6.4) and the lack of an increase in negative health outcomes in 2013, the large increase in the share of beneficiaries who stopped using test strips after certain suppliers did not win a contract suggests that some suppliers were likely supplying test strips inappropriately before the NMOP.**

<sup>55</sup> Office of Inspector General, Department of Health and Human Services. August 2013. *Inappropriate and Questionable Medicare Billing for Diabetes Test Strips (OEI-04-11-00330)*. Washington, DC: OIG.

**Table 6-7. Churn rate for top 10 test strip suppliers with the biggest increase in the number of stoppers from 2012 to 2013**

Supplier rank	Total test strip users in June 2012	Total test strip users in June 2013	Share of stoppers in 2012	Share of stoppers in 2013	Share of stoppers 2012-2013 change (percentage point)	City	State	Bid winner as of July 2013
<b>National (excl. Round 1 CBAs)</b>	<b>916,143</b>	<b>984,808</b>	<b>14.1%</b>	<b>22.0%</b>	<b>7.9</b>	-	-	-
1	17,892	27,441	6.8%	42.6%	35.8	Boca Raton	FL	N
2	35,363	137,778	15.4%	11.3%	-4.0	Coral Springs	FL	Y
3	20,597	81,181	5.0%	11.7%	6.7	Milford	NJ	N
4	4,798	12,583	10.4%	62.3%	51.9	Carlsbad	CA	N
5	1,706	5,524	14.2%	75.2%	61.0	Oxford	MS	N
6	13,766	13,519	16.8%	45.6%	28.7	Tempe	AZ	N
7	7,118	8,049	6.8%	42.4%	35.6	Miami	FL	N
8	4,998	5,529	10.9%	55.4%	44.6	Milford	MA	N
9	1,757	5,274	12.8%	51.3%	38.4	Hernando	MS	N
10	19,552	36,618	11.6%	12.9%	1.3	Doral	FL	Y

### 6.3.2 Beneficiaries who Obtained a New Glucose Meter

In earlier sections of this report, we mentioned that the number of beneficiaries who obtained a glucose meter increased drastically from May through October 2013, which may be a sign of beneficiaries having difficulty obtaining test strips compatible with the glucose meter they own and thus switching to a different brand of glucose meter and test strips. To verify this hypothesis, we identified beneficiaries who had an allowed glucose meter claim during May-October 2013 and summarized their test strip claims' patterns and health outcomes. For comparison, we performed the same analysis for May-October 2012 and May-October 2014. The results are summarized in *Table 6-8*.

The number of glucose meter users more than doubled in 2013, which is consistent with the results of our trend analysis (*Figure 6-4*). We examined the glucose meter users' test strip utilization patterns based on the presence of allowed test strip claims in the 180 days prior to and 180 days following the receipt of the glucose meter, so the beneficiaries can generally be categorized as stoppers (had an allowed test strip claim before receiving the glucose meter but no such claims afterwards), continuing users (had allowed test strip claims both before and after), non-users (had no allowed test strip claims before or after), or new users (only had allowed test strip claims after receiving the glucose meter). For all three years, the vast majority of glucose meter users are continuing users or new users of test strips. However, 2013 has more continuing users than the other two years. There are two scenarios for a continuing user of test strip to receive a new glucose meter: 1) the beneficiary's glucose meter has failed to function or reached its lifespan, so he orders a new glucose meter (of the same or a different brand) and continues to receive test strips; 2) the beneficiary has decided to switch to a new brand of glucose meter for some reason (e.g., unable to find a supplier that can furnish the brand of test strip he needs) and starts to receive test strips matched to his new meter. The second scenario seems more likely to explain the influx of glucose meter users in 2013.



**Table 6-8. Test strip utilization patterns and health outcomes among new glucose meter users in 2012, 2013, and 2014** <sup>56</sup>

Metric	2012	2013	2014
<b>Beneficiaries who purchased a new glucose meter during May-October</b>	<b>192,612</b>	<b>499,512</b>	<b>126,451</b>
<b>Test strip utilization before and after receiving the glucose meter</b>			
Stoppers	1.4%	0.8%	2.2%
Continuing users	36.5%	53.8%	27.3%
Non-users	1.8%	0.8%	2.0%
New users	60.3%	44.5%	68.5%
<b>Health outcomes in 180 days following the receipt of glucose meter</b>			
Mortality	2.6%	2.5%	2.7%
ER	32.9%	27.8%	32.0%
Hospitalization	19.4%	16.6%	18.4%
IP payment per capita	\$ 2,465.21	\$ 2,160.64	\$ 2,366.14

Note: For test strip utilization patterns, the percentages should technically add up to 100%; but because of the limited decimals shown on the chart after rounding, the sum may seem like it is slightly lower or higher than 100%. For health outcome rates, we performed unequal variance t-tests for pairwise rate differences between 2013 and the other two years and chi-squared tests for rate differences across the three years, and they all showed p-values smaller than 0.01.

To understand the impact of the increase in glucose meter claims on beneficiary health outcomes, we analyzed mortality, ER, and hospitalization rates, as well as inpatient payment per capita, in the 180 days following the receipt of glucose meter. As *Table 6-8* shows, beneficiaries who obtained a new glucose meter in mid-2013 have lower rates of adverse health outcomes than their peers in 2012 and 2014.

To better contextualize these trends, we extended the analysis to cover beneficiaries who did not purchase a new glucose meter. First, we defined a base population that includes continuing users of test strip: beneficiaries who were enrolled in Parts A and B (and not in an MA plan) for the entire year of observation (2012, 2013, or 2014), and had an allowed test strip claim in the first and the second half of the year. Next, we identified those who had an allowed glucose meter claim in June or July of the year and those who did not have an allowed glucose meter claim from May through October. Finally, we compared the two group's health outcomes over the 6-month period from July to December. These numbers are displayed in *Table 6-9*.

For beneficiaries who did not purchase a new glucose meter, health outcome rates are similar across the three years, with 2013 being slightly lower. For beneficiaries who purchased a new glucose meter, outcome rates are substantially lower in 2013 relative to the other two years, which supports the conclusion drawn from *Table 6-8*. Furthermore, the data for 2012 and 2014 suggest that new purchasers generally have higher adverse health outcome rates than those who did not purchase a new meter (e.g., ER rate is 34.5% for new purchasers in 2012 and 28.8% for non-purchasers in the same year), but 2013 shows reversed trends. It is safe to infer that the composition of new purchasers changed substantially in

<sup>56</sup> Apart from E0607 (Home blood glucose monitor), there are two other codes that are also glucose monitors: E2100 (Blood glucose monitor with integrated voice synthesizer) and E2101 (Blood glucose monitor with integrated lancing/blood sample). Utilization of these two types of glucose monitors is rare as compared to E0607. We performed the same analysis with E2100 and E2101 added to define utilization of a glucose meter, but the test strip billing patterns and health outcome trends were similar to those presented in *Table 6-8*.

2013 because of the increase in beneficiaries purchasing a new meter in response to the NMOP, and that health outcome rates were driven down by this influx of new purchasers.

**Table 6-9. Health outcomes among continuing test strip users who obtained a new glucose meter and those who did not in 2012, 2013, and 2014** <sup>57</sup>

Year	Number of beneficiaries who purchased glucose meter	Mortality Rate	ER Rate	Hospitalization Rate	Inpatient Spending per Capita
2012	33,816	1.6%	34.5%	19.6%	\$3,003.35
2013	172,414	1.5%	26.9%	15.4%	\$2,281.76
2014	17,464	1.7%	32.6%	18.3%	\$2,887.61

Year	Number of beneficiaries who did not purchase glucose meter	Mortality Rate	ER Rate	Hospitalization Rate	Inpatient Spending per Capita
2012	2,194,922	1.6%	28.8%	16.9%	\$2,578.80
2013	1,601,640	1.4%	28.2%	15.9%	\$2,445.95
2014	1,871,943	1.6%	28.5%	15.8%	\$2,483.60

Note: For health outcome rates, we performed unequal variance t-tests for pairwise rate differences between 2013 and the other two years and chi-squared tests for rate differences across the three years. Most comparisons showed p-values smaller than 0.01, except for hospitalization rates for non-purchasers between 2013 and 2014, and mortality rates for glucose meter purchasers across all three years.

**To sum up, the implementation of the NMOP resulted in an influx of beneficiaries who obtained a new glucose meter in mid-2013. However, this increase appears to have had no negative effects on health outcomes. In fact, beneficiaries who received a glucose meter during May-October 2013 have lower adverse health outcome rates than similar populations in 2012 and 2014 after receiving the meter.**

#### 6.4 RETAIL SUPPLIER ANALYSIS

The decline in mail-order users and the modest increase in retail users prompted us to wonder whether retail test strips could be a feasible option for beneficiaries experiencing difficulty purchasing mail-order supplies (to the extent difficulties existed). Therefore, we conducted further analyses to identify retail test strip suppliers at the county level, and calculated the percentage of Original Medicare beneficiaries living in a county with at least one supplier that billed Medicare for retail test strip in 2017. *Table 6-10* shows that: out of 36 million beneficiaries in the entire nation,<sup>58</sup> 99% were living in a county with at least one retail test strip supplier; 90% were living in a county with at least five retail test strip suppliers; and about half of all beneficiaries were living in a county with at least 50 retail test strip suppliers. **Therefore, for most beneficiaries, purchasing test strips from a local retailer may be an option if they cannot obtain test strips via mail-order or if they prefer a specific brand of test strip that is not available via mail-order.**

<sup>57</sup> We performed the same analysis with E2100 and E2101 added to define utilization of a glucose meter, but the health outcome trends were similar to those presented in *Table 6-9*.

<sup>58</sup> The number represents beneficiaries who had at least one month of Parts A and B enrollment in 2017, regardless of where the beneficiary was living (meaning that Round 1 CBAs are included; this is for us to examine access to retail test strip suppliers in the entire nation).

**Table 6-10. Number of beneficiaries living in counties with one or more retail test strip suppliers in 2017**

<b>County type</b>	<b>Number of Original Medicare beneficiaries</b>	<b>Percent of national Original Medicare beneficiaries</b>
<b>All counties</b>	35,945,361	100.0%
<b>Counties with ≥ 1 retailer</b>	35,522,495	98.8%
<b>Counties with ≥ 2 retailers</b>	34,933,838	97.2%
<b>Counties with ≥ 5 retailers</b>	32,190,569	89.6%
<b>Counties with ≥ 10 retailers</b>	28,229,715	78.5%
<b>Counties with ≥ 50 retailers</b>	17,065,704	47.5%
<b>Counties with ≥ 100 retailers</b>	11,159,931	31.0%

## 7 CONCLUSIONS

The DMEPOS Competitive Bidding Program (CBP) is designed to harness marketplace dynamics to improve the pricing methodology for DMEPOS items, reduce Medicare and beneficiary spending, and curb fraud and overutilization. In July 2013, a nationwide CBP for mail-order diabetic testing supplies (DTS) was implemented, known as the National Mail-Order Program (NMOP). Some stated that the policy reduced unnecessary utilization of DTS with no negative impact on beneficiary health outcomes, while some claimed that the policy resulted in disrupted access to DTS and higher rates of mortality, hospital admissions, and costs.

We conducted a comprehensive analysis of the impact of the NMOP on utilization of diabetic supplies and beneficiary health outcomes. We have the following findings:

1. Based on Medicare claims data, there is a substantial decline in utilization of mail-order diabetic test strips after the implementation of the NMOP in July 2013, but utilization of retail test strips increased modestly.
2. Mortality, hospitalization, and emergency room (ER) visit rates among Medicare FFS diabetics and regular insulin users have remained stable after the implementation of the NMOP.
3. After controlling for the demographic composition of the regular insulin user population and employing our regression model, we still see no significant effect of the NMOP on adverse health outcomes.
4. There is an increase in beneficiaries who stopped using test strips and those who received a new glucose meter after the implementation of the NMOP, but these trends did not appear to adversely affect mortality, hospitalization, and ER rates.
5. Beneficiaries continue to have access to local, retail test strip suppliers: 99% of Original Medicare beneficiaries in 2017 lived in a county with at least one supplier that billed Medicare for retail test strips in that year.

## APPENDIX

### A. LIST OF DIAGNOSIS CODES FOR DIABETES MELLITUS

The following table shows the ICD diagnosis codes that were used to define diabetics.

DGN Code	ICD	Type of Diabetes	Description
25000	ICD-9	Type 2	Diabetes mellitus without mention of complication, type II or unspecified type, not stated as uncontrolled
25002	ICD-9	Type 2	Diabetes mellitus without mention of complication, type II or unspecified type, uncontrolled
25010	ICD-9	Type 2	Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled
25012	ICD-9	Type 2	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled
25020	ICD-9	Type 2	Diabetes with hyperosmolarity, type II or unspecified type, not stated as uncontrolled
25022	ICD-9	Type 2	Diabetes with hyperosmolarity, type II or unspecified type, uncontrolled
25030	ICD-9	Type 2	Diabetes with other coma, type II or unspecified type, not stated as uncontrolled
25032	ICD-9	Type 2	Diabetes with other coma, type II or unspecified type, uncontrolled
25040	ICD-9	Type 2	Diabetes with renal manifestations, type II or unspecified type, not stated as uncontrolled
25042	ICD-9	Type 2	Diabetes with renal manifestations, type II or unspecified type, uncontrolled
25050	ICD-9	Type 2	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled
25052	ICD-9	Type 2	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled
25060	ICD-9	Type 2	Diabetes with neurological manifestations, type II or unspecified type, not stated as uncontrolled
25062	ICD-9	Type 2	Diabetes with neurological manifestations, type II or unspecified type, uncontrolled
25070	ICD-9	Type 2	Diabetes with peripheral circulatory disorders, type II or unspecified type, not stated as uncontrolled
25072	ICD-9	Type 2	Diabetes with peripheral circulatory disorders, type II or unspecified type, uncontrolled
25080	ICD-9	Type 2	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled
25082	ICD-9	Type 2	Diabetes with other specified manifestations, type II or unspecified type, uncontrolled
25090	ICD-9	Type 2	Diabetes with unspecified complication, type II or unspecified type, not stated as uncontrolled
25092	ICD-9	Type 2	Diabetes with unspecified complication, type II or unspecified type, uncontrolled
E1100	ICD-10	Type 2	Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E1101	ICD-10	Type 2	Type 2 diabetes mellitus with hyperosmolarity with coma
E1110	ICD-10	Type 2	Type 2 diabetes mellitus with ketoacidosis without coma
E1111	ICD-10	Type 2	Type 2 diabetes mellitus with ketoacidosis with coma
E1121	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic nephropathy

E1122	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic chronic kidney disease
E1129	ICD-10	Type 2	Type 2 diabetes mellitus with other diabetic kidney complication
E11311	ICD-10	Type 2	Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
E11319	ICD-10	Type 2	Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema
E11321	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E113211	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E113212	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E113213	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E113219	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E11329	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E113291	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E113292	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E113293	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E113299	ICD-10	Type 2	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11331	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E113311	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E113312	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E113313	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E113319	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E11339	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E113391	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E113392	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E113393	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E113399	ICD-10	Type 2	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11341	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E113411	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E113412	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E113413	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E113419	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye

E11349	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E113491	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E113492	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E113493	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E113499	ICD-10	Type 2	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11351	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema
E113511	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E113512	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E113513	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E113519	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E113521	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E113522	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E113523	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E113529	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E113531	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E113532	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E113533	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E113539	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E113541	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E113542	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E113543	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E113549	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E113551	ICD-10	Type 2	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E113552	ICD-10	Type 2	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E113553	ICD-10	Type 2	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E113559	ICD-10	Type 2	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E11359	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema
E113591	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E113592	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye

E113593	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E113599	ICD-10	Type 2	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1136	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic cataract
E1137X1	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1137X2	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1137X3	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1137X9	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1139	ICD-10	Type 2	Type 2 diabetes mellitus with other diabetic ophthalmic complication
E1140	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic neuropathy, unspecified
E1141	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic mononeuropathy
E1142	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic polyneuropathy
E1143	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy
E1144	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic amyotrophy
E1149	ICD-10	Type 2	Type 2 diabetes mellitus with other diabetic neurological complication
E1151	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1152	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1159	ICD-10	Type 2	Type 2 diabetes mellitus with other circulatory complications
E11610	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic neuropathic arthropathy
E11618	ICD-10	Type 2	Type 2 diabetes mellitus with other diabetic arthropathy
E11620	ICD-10	Type 2	Type 2 diabetes mellitus with diabetic dermatitis
E11621	ICD-10	Type 2	Type 2 diabetes mellitus with foot ulcer
E11622	ICD-10	Type 2	Type 2 diabetes mellitus with other skin ulcer
E11628	ICD-10	Type 2	Type 2 diabetes mellitus with other skin complications
E11630	ICD-10	Type 2	Type 2 diabetes mellitus with periodontal disease
E11638	ICD-10	Type 2	Type 2 diabetes mellitus with other oral complications
E11641	ICD-10	Type 2	Type 2 diabetes mellitus with hypoglycemia with coma
E11649	ICD-10	Type 2	Type 2 diabetes mellitus with hypoglycemia without coma
E1165	ICD-10	Type 2	Type 2 diabetes mellitus with hyperglycemia
E1169	ICD-10	Type 2	Type 2 diabetes mellitus with other specified complication



E118	ICD-10	Type 2	Type 2 diabetes mellitus with unspecified complications
E119	ICD-10	Type 2	Type 2 diabetes mellitus without complications
O24111	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in pregnancy, first trimester
O24112	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in pregnancy, second trimester
O24113	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in pregnancy, third trimester
O24119	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in pregnancy, unspecified trimester
O2412	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in childbirth
O2413	ICD-10	Type 2	Pre-existing type 2 diabetes mellitus, in the puerperium
25001	ICD-9	Type 1	Diabetes mellitus without mention of complication, type I [juvenile type], not stated as uncontrolled
25003	ICD-9	Type 1	Diabetes mellitus without mention of complication, type I [juvenile type], uncontrolled
25011	ICD-9	Type 1	Diabetes with ketoacidosis, type I [juvenile type], not stated as uncontrolled
25013	ICD-9	Type 1	Diabetes with ketoacidosis, type I [juvenile type], uncontrolled
25021	ICD-9	Type 1	Diabetes with hyperosmolarity, type I [juvenile type], not stated as uncontrolled
25023	ICD-9	Type 1	Diabetes with hyperosmolarity, type I [juvenile type], uncontrolled
25031	ICD-9	Type 1	Diabetes with other coma, type I [juvenile type], not stated as uncontrolled
25033	ICD-9	Type 1	Diabetes with other coma, type I [juvenile type], uncontrolled
25041	ICD-9	Type 1	Diabetes with renal manifestations, type I [juvenile type], not stated as uncontrolled
25043	ICD-9	Type 1	Diabetes with renal manifestations, type I [juvenile type], uncontrolled
25051	ICD-9	Type 1	Diabetes with ophthalmic manifestations, type I [juvenile type], not stated as uncontrolled
25053	ICD-9	Type 1	Diabetes with ophthalmic manifestations, type I [juvenile type], uncontrolled
25061	ICD-9	Type 1	Diabetes with neurological manifestations, type I [juvenile type], not stated as uncontrolled
25063	ICD-9	Type 1	Diabetes with neurological manifestations, type I [juvenile type], uncontrolled
25071	ICD-9	Type 1	Diabetes with peripheral circulatory disorders, type I [juvenile type], not stated as uncontrolled
25073	ICD-9	Type 1	Diabetes with peripheral circulatory disorders, type I [juvenile type], uncontrolled
25081	ICD-9	Type 1	Diabetes with other specified manifestations, type I [juvenile type], not stated as uncontrolled
25083	ICD-9	Type 1	Diabetes with other specified manifestations, type I [juvenile type], uncontrolled
25091	ICD-9	Type 1	Diabetes with unspecified complication, type I [juvenile type], not stated as uncontrolled
25093	ICD-9	Type 1	Diabetes with unspecified complication, type I [juvenile type], uncontrolled
E1010	ICD-10	Type 1	Type 1 diabetes mellitus with ketoacidosis without coma

E1011	ICD-10	Type 1	Type 1 diabetes mellitus with ketoacidosis with coma
E1021	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic nephropathy
E1022	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic chronic kidney disease
E1029	ICD-10	Type 1	Type 1 diabetes mellitus with other diabetic kidney complication
E10311	ICD-10	Type 1	Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema
E10319	ICD-10	Type 1	Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema
E10321	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E103211	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E103212	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E103213	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E103219	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10329	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E103291	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E103292	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E103293	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E103299	ICD-10	Type 1	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10331	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E103311	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E103312	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E103313	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E103319	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10339	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E103391	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E103392	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E103393	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E103399	ICD-10	Type 1	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10341	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E103411	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E103412	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye

E103413	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E103419	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10349	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E103491	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E103492	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E103493	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E103499	ICD-10	Type 1	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10351	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema
E103511	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E103512	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E103513	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E103519	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E103521	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E103522	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E103523	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E103529	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E103531	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E103532	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E103533	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E103539	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E103541	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E103542	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E103543	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E103549	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E103551	ICD-10	Type 1	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E103552	ICD-10	Type 1	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E103553	ICD-10	Type 1	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E103559	ICD-10	Type 1	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E10359	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema

E103591	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E103592	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E103593	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E103599	ICD-10	Type 1	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1036	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic cataract
E1037X1	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1037X2	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1037X3	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1037X9	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1039	ICD-10	Type 1	Type 1 diabetes mellitus with other diabetic ophthalmic complication
E1040	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic neuropathy, unspecified
E1041	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic mononeuropathy
E1042	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic polyneuropathy
E1043	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic autonomic (poly)neuropathy
E1044	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic amyotrophy
E1049	ICD-10	Type 1	Type 1 diabetes mellitus with other diabetic neurological complication
E1051	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1052	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1059	ICD-10	Type 1	Type 1 diabetes mellitus with other circulatory complications
E10610	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic neuropathic arthropathy
E10618	ICD-10	Type 1	Type 1 diabetes mellitus with other diabetic arthropathy
E10620	ICD-10	Type 1	Type 1 diabetes mellitus with diabetic dermatitis
E10621	ICD-10	Type 1	Type 1 diabetes mellitus with foot ulcer
E10622	ICD-10	Type 1	Type 1 diabetes mellitus with other skin ulcer
E10628	ICD-10	Type 1	Type 1 diabetes mellitus with other skin complications
E10630	ICD-10	Type 1	Type 1 diabetes mellitus with periodontal disease
E10638	ICD-10	Type 1	Type 1 diabetes mellitus with other oral complications
E10641	ICD-10	Type 1	Type 1 diabetes mellitus with hypoglycemia with coma
E10649	ICD-10	Type 1	Type 1 diabetes mellitus with hypoglycemia without coma

E1065	ICD-10	Type 1	Type 1 diabetes mellitus with hyperglycemia
E1069	ICD-10	Type 1	Type 1 diabetes mellitus with other specified complication
E108	ICD-10	Type 1	Type 1 diabetes mellitus with unspecified complications
E109	ICD-10	Type 1	Type 1 diabetes mellitus without complications
O24011	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in pregnancy, first trimester
O24012	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in pregnancy, second trimester
O24013	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in pregnancy, third trimester
O24019	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in pregnancy, unspecified trimester
O2402	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in childbirth
O2403	ICD-10	Type 1	Pre-existing type 1 diabetes mellitus, in the puerperium
3572	ICD-9	Other	Polyneuropathy in diabetes
7750	ICD-9	Other	Syndrome of "infant of a diabetic mother"
7751	ICD-9	Other	Neonatal diabetes mellitus
24900	ICD-9	Other	Secondary diabetes mellitus without mention of complication, not stated as uncontrolled, or unspecified
24901	ICD-9	Other	Secondary diabetes mellitus without mention of complication, uncontrolled
24910	ICD-9	Other	Secondary diabetes mellitus with ketoacidosis, not stated as uncontrolled, or unspecified
24911	ICD-9	Other	Secondary diabetes mellitus with ketoacidosis, uncontrolled
24920	ICD-9	Other	Secondary diabetes mellitus with hyperosmolarity, not stated as uncontrolled, or unspecified
24921	ICD-9	Other	Secondary diabetes mellitus with hyperosmolarity, uncontrolled
24930	ICD-9	Other	Secondary diabetes mellitus with other coma, not stated as uncontrolled, or unspecified
24931	ICD-9	Other	Secondary diabetes mellitus with other coma, uncontrolled
24940	ICD-9	Other	Secondary diabetes mellitus with renal manifestations, not stated as uncontrolled, or unspecified
24941	ICD-9	Other	Secondary diabetes mellitus with renal manifestations, uncontrolled
24950	ICD-9	Other	Secondary diabetes mellitus with ophthalmic manifestations, not stated as uncontrolled, or unspecified
24951	ICD-9	Other	Secondary diabetes mellitus with ophthalmic manifestations, uncontrolled
24960	ICD-9	Other	Secondary diabetes mellitus with neurological manifestations, not stated as uncontrolled, or unspecified
24961	ICD-9	Other	Secondary diabetes mellitus with neurological manifestations, uncontrolled
24970	ICD-9	Other	Secondary diabetes mellitus with peripheral circulatory disorders, not stated as uncontrolled, or unspecified
24971	ICD-9	Other	Secondary diabetes mellitus with peripheral circulatory disorders, uncontrolled

24980	ICD-9	Other	Secondary diabetes mellitus with other specified manifestations, not stated as uncontrolled, or unspecified
24981	ICD-9	Other	Secondary diabetes mellitus with other specified manifestations, uncontrolled
24990	ICD-9	Other	Secondary diabetes mellitus with unspecified complication, not stated as uncontrolled, or unspecified
24991	ICD-9	Other	Secondary diabetes mellitus with unspecified complication, uncontrolled
36201	ICD-9	Other	Background diabetic retinopathy
36202	ICD-9	Other	Proliferative diabetic retinopathy
36203	ICD-9	Other	Nonproliferative diabetic retinopathy NOS
36204	ICD-9	Other	Mild nonproliferative diabetic retinopathy
36205	ICD-9	Other	Moderate nonproliferative diabetic retinopathy
36206	ICD-9	Other	Severe nonproliferative diabetic retinopathy
36207	ICD-9	Other	Diabetic macular edema
64800	ICD-9	Other	Diabetes mellitus of mother, complicating pregnancy, childbirth, or the puerperium, unspecified as to episode of care or not
64801	ICD-9	Other	Diabetes mellitus of mother, complicating pregnancy, childbirth, or the puerperium, delivered, with or without mention of ant
64802	ICD-9	Other	Diabetes mellitus of mother, complicating pregnancy, childbirth, or the puerperium, delivered, with mention of postpartum com
64803	ICD-9	Other	Diabetes mellitus of mother, complicating pregnancy, childbirth, or the puerperium, antepartum condition or complication
64804	ICD-9	Other	Diabetes mellitus of mother, complicating pregnancy, childbirth, or the puerperium, postpartum condition or complication
E0800	ICD-10	Other	Diabetes mellitus due to underlying condition with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E0801	ICD-10	Other	Diabetes mellitus due to underlying condition with hyperosmolarity with coma
E0810	ICD-10	Other	Diabetes mellitus due to underlying condition with ketoacidosis without coma
E0811	ICD-10	Other	Diabetes mellitus due to underlying condition with ketoacidosis with coma
E0821	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic nephropathy
E0822	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic chronic kidney disease
E0829	ICD-10	Other	Diabetes mellitus due to underlying condition with other diabetic kidney complication
E08311	ICD-10	Other	Diabetes mellitus due to underlying condition with unspecified diabetic retinopathy with macular edema
E08319	ICD-10	Other	Diabetes mellitus due to underlying condition with unspecified diabetic retinopathy without macular edema
E08321	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema
E083211	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, right eye
E083212	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, left eye
E083213	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, bilateral

E083219	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E08329	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema
E083291	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, right eye
E083292	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, left eye
E083293	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E083299	ICD-10	Other	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E08331	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema
E083311	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E083312	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E083313	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E083319	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E08339	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema
E083391	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E083392	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E083393	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E083399	ICD-10	Other	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E08341	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema
E083411	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, right eye
E083412	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, left eye
E083413	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E083419	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E08349	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema
E083491	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, right eye
E083492	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, left eye
E083493	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E083499	ICD-10	Other	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E08351	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema
E083511	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, right eye
E083512	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, left eye

E083513	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, bilateral
E083519	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, unspecified eye
E083521	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E083522	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E083523	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E083529	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E083531	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E083532	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E083533	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E083539	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E083541	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E083542	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E083543	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E083549	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E083551	ICD-10	Other	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, right eye
E083552	ICD-10	Other	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, left eye
E083553	ICD-10	Other	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, bilateral
E083559	ICD-10	Other	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, unspecified eye
E08359	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema
E083591	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, right eye
E083592	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, left eye
E083593	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, bilateral
E083599	ICD-10	Other	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, unspecified eye
E0836	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic cataract
E0837X1	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, right eye
E0837X2	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, left eye
E0837X3	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, bilateral
E0837X9	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, unspecified eye
E0839	ICD-10	Other	Diabetes mellitus due to underlying condition with other diabetic ophthalmic complication



E0840	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic neuropathy, unspecified
E0841	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic mononeuropathy
E0842	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic polyneuropathy
E0843	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic autonomic (poly)neuropathy
E0844	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic amyotrophy
E0849	ICD-10	Other	Diabetes mellitus due to underlying condition with other diabetic neurological complication
E0851	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic peripheral angiopathy without gangrene
E0852	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic peripheral angiopathy with gangrene
E0859	ICD-10	Other	Diabetes mellitus due to underlying condition with other circulatory complications
E08610	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic neuropathic arthropathy
E08618	ICD-10	Other	Diabetes mellitus due to underlying condition with other diabetic arthropathy
E08620	ICD-10	Other	Diabetes mellitus due to underlying condition with diabetic dermatitis
E08621	ICD-10	Other	Diabetes mellitus due to underlying condition with foot ulcer
E08622	ICD-10	Other	Diabetes mellitus due to underlying condition with other skin ulcer
E08628	ICD-10	Other	Diabetes mellitus due to underlying condition with other skin complications
E08630	ICD-10	Other	Diabetes mellitus due to underlying condition with periodontal disease
E08638	ICD-10	Other	Diabetes mellitus due to underlying condition with other oral complications
E08641	ICD-10	Other	Diabetes mellitus due to underlying condition with hypoglycemia with coma
E08649	ICD-10	Other	Diabetes mellitus due to underlying condition with hypoglycemia without coma
E0865	ICD-10	Other	Diabetes mellitus due to underlying condition with hyperglycemia
E0869	ICD-10	Other	Diabetes mellitus due to underlying condition with other specified complication
E088	ICD-10	Other	Diabetes mellitus due to underlying condition with unspecified complications
E089	ICD-10	Other	Diabetes mellitus due to underlying condition without complications
E0900	ICD-10	Other	Drug or chemical induced diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E0901	ICD-10	Other	Drug or chemical induced diabetes mellitus with hyperosmolarity with coma
E0910	ICD-10	Other	Drug or chemical induced diabetes mellitus with ketoacidosis without coma
E0911	ICD-10	Other	Drug or chemical induced diabetes mellitus with ketoacidosis with coma
E0921	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic nephropathy
E0922	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic chronic kidney disease

E0929	ICD-10	Other	Drug or chemical induced diabetes mellitus with other diabetic kidney complication
E09311	ICD-10	Other	Drug or chemical induced diabetes mellitus with unspecified diabetic retinopathy with macular edema
E09319	ICD-10	Other	Drug or chemical induced diabetes mellitus with unspecified diabetic retinopathy without macular edema
E09321	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E093211	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E093212	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E093213	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E093219	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E09329	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E093291	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E093292	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E093293	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E093299	ICD-10	Other	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E09331	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E093311	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E093312	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E093313	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E093319	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E09339	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E093391	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E093392	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E093393	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E093399	ICD-10	Other	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E09341	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E093411	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E093412	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E093413	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E093419	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E09349	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema

E093491	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E093492	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E093493	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E093499	ICD-10	Other	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E09351	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema
E093511	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E093512	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E093513	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E093519	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E093521	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E093522	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E093523	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E093529	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E093531	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E093532	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E093533	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E093539	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E093541	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E093542	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E093543	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E093549	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E093551	ICD-10	Other	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E093552	ICD-10	Other	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E093553	ICD-10	Other	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E093559	ICD-10	Other	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E09359	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema
E093591	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E093592	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E093593	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral

E093599	ICD-10	Other	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E0936	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic cataract
E0937X1	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E0937X2	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E0937X3	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E0937X9	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E0939	ICD-10	Other	Drug or chemical induced diabetes mellitus with other diabetic ophthalmic complication
E0940	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with diabetic neuropathy, unspecified
E0941	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with diabetic mononeuropathy
E0942	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with diabetic polyneuropathy
E0943	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with diabetic autonomic (poly)neuropathy
E0944	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with diabetic amyotrophy
E0949	ICD-10	Other	Drug or chemical induced diabetes mellitus with neurological complications with other diabetic neurological complication
E0951	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic peripheral angiopathy without gangrene
E0952	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic peripheral angiopathy with gangrene
E0959	ICD-10	Other	Drug or chemical induced diabetes mellitus with other circulatory complications
E09610	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic neuropathic arthropathy
E09618	ICD-10	Other	Drug or chemical induced diabetes mellitus with other diabetic arthropathy
E09620	ICD-10	Other	Drug or chemical induced diabetes mellitus with diabetic dermatitis
E09621	ICD-10	Other	Drug or chemical induced diabetes mellitus with foot ulcer
E09622	ICD-10	Other	Drug or chemical induced diabetes mellitus with other skin ulcer
E09628	ICD-10	Other	Drug or chemical induced diabetes mellitus with other skin complications
E09630	ICD-10	Other	Drug or chemical induced diabetes mellitus with periodontal disease
E09638	ICD-10	Other	Drug or chemical induced diabetes mellitus with other oral complications
E09641	ICD-10	Other	Drug or chemical induced diabetes mellitus with hypoglycemia with coma
E09649	ICD-10	Other	Drug or chemical induced diabetes mellitus with hypoglycemia without coma
E0965	ICD-10	Other	Drug or chemical induced diabetes mellitus with hyperglycemia
E0969	ICD-10	Other	Drug or chemical induced diabetes mellitus with other specified complication
E098	ICD-10	Other	Drug or chemical induced diabetes mellitus with unspecified complications

E099	ICD-10	Other	Drug or chemical induced diabetes mellitus without complications
E1300	ICD-10	Other	Other specified diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E1301	ICD-10	Other	Other specified diabetes mellitus with hyperosmolarity with coma
E1310	ICD-10	Other	Other specified diabetes mellitus with ketoacidosis without coma
E1311	ICD-10	Other	Other specified diabetes mellitus with ketoacidosis with coma
E1321	ICD-10	Other	Other specified diabetes mellitus with diabetic nephropathy
E1322	ICD-10	Other	Other specified diabetes mellitus with diabetic chronic kidney disease
E1329	ICD-10	Other	Other specified diabetes mellitus with other diabetic kidney complication
E13311	ICD-10	Other	Other specified diabetes mellitus with unspecified diabetic retinopathy with macular edema
E13319	ICD-10	Other	Other specified diabetes mellitus with unspecified diabetic retinopathy without macular edema
E13321	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E133211	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E133212	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E133213	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E133219	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13329	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E133291	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E133292	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E133293	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E133299	ICD-10	Other	Other specified diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13331	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E133311	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E133312	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E133313	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E133319	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13339	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E133391	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E133392	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E133393	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral

E133399	ICD-10	Other	Other specified diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13341	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E133411	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E133412	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E133413	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E133419	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E13349	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E133491	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E133492	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E133493	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E133499	ICD-10	Other	Other specified diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E13351	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema
E133511	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E133512	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E133513	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E133519	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E133521	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E133522	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E133523	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E133529	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E133531	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E133532	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E133533	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E133539	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E133541	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E133542	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E133543	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E133549	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E133551	ICD-10	Other	Other specified diabetes mellitus with stable proliferative diabetic retinopathy, right eye

E133552	ICD-10	Other	Other specified diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E133553	ICD-10	Other	Other specified diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E133559	ICD-10	Other	Other specified diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E13359	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema
E133591	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E133592	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E133593	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E133599	ICD-10	Other	Other specified diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1336	ICD-10	Other	Other specified diabetes mellitus with diabetic cataract
E1337X1	ICD-10	Other	Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1337X2	ICD-10	Other	Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1337X3	ICD-10	Other	Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1337X9	ICD-10	Other	Other specified diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1339	ICD-10	Other	Other specified diabetes mellitus with other diabetic ophthalmic complication
E1340	ICD-10	Other	Other specified diabetes mellitus with diabetic neuropathy, unspecified
E1341	ICD-10	Other	Other specified diabetes mellitus with diabetic mononeuropathy
E1342	ICD-10	Other	Other specified diabetes mellitus with diabetic polyneuropathy
E1343	ICD-10	Other	Other specified diabetes mellitus with diabetic autonomic (poly)neuropathy
E1344	ICD-10	Other	Other specified diabetes mellitus with diabetic amyotrophy
E1349	ICD-10	Other	Other specified diabetes mellitus with other diabetic neurological complication
E1351	ICD-10	Other	Other specified diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1352	ICD-10	Other	Other specified diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1359	ICD-10	Other	Other specified diabetes mellitus with other circulatory complications
E13610	ICD-10	Other	Other specified diabetes mellitus with diabetic neuropathic arthropathy
E13618	ICD-10	Other	Other specified diabetes mellitus with other diabetic arthropathy
E13620	ICD-10	Other	Other specified diabetes mellitus with diabetic dermatitis
E13621	ICD-10	Other	Other specified diabetes mellitus with foot ulcer
E13622	ICD-10	Other	Other specified diabetes mellitus with other skin ulcer
E13628	ICD-10	Other	Other specified diabetes mellitus with other skin complications

E13630	ICD-10	Other	Other specified diabetes mellitus with periodontal disease
E13638	ICD-10	Other	Other specified diabetes mellitus with other oral complications
E13641	ICD-10	Other	Other specified diabetes mellitus with hypoglycemia with coma
E13649	ICD-10	Other	Other specified diabetes mellitus with hypoglycemia without coma
E1365	ICD-10	Other	Other specified diabetes mellitus with hyperglycemia
E1369	ICD-10	Other	Other specified diabetes mellitus with other specified complication
E138	ICD-10	Other	Other specified diabetes mellitus with unspecified complications
E139	ICD-10	Other	Other specified diabetes mellitus without complications
O24311	ICD-10	Other	Unspecified pre-existing diabetes mellitus in pregnancy, first trimester
O24312	ICD-10	Other	Unspecified pre-existing diabetes mellitus in pregnancy, second trimester
O24313	ICD-10	Other	Unspecified pre-existing diabetes mellitus in pregnancy, third trimester
O24319	ICD-10	Other	Unspecified pre-existing diabetes mellitus in pregnancy, unspecified trimester
O2432	ICD-10	Other	Unspecified pre-existing diabetes mellitus in childbirth
O2433	ICD-10	Other	Unspecified pre-existing diabetes mellitus in the puerperium
O24410	ICD-10	Other	Gestational diabetes mellitus in pregnancy, diet controlled
O24414	ICD-10	Other	Gestational diabetes mellitus in pregnancy, insulin controlled
O24415	ICD-10	Other	Gestational diabetes mellitus in pregnancy, controlled by oral hypoglycemic drugs
O24419	ICD-10	Other	Gestational diabetes mellitus in pregnancy, unspecified control
O24420	ICD-10	Other	Gestational diabetes mellitus in childbirth, diet controlled
O24424	ICD-10	Other	Gestational diabetes mellitus in childbirth, insulin controlled
O24425	ICD-10	Other	Gestational diabetes mellitus in childbirth, controlled by oral hypoglycemic drugs
O24429	ICD-10	Other	Gestational diabetes mellitus in childbirth, unspecified control
O24430	ICD-10	Other	Gestational diabetes mellitus in the puerperium, diet controlled
O24434	ICD-10	Other	Gestational diabetes mellitus in the puerperium, insulin controlled
O24435	ICD-10	Other	Gestational diabetes mellitus in puerperium, controlled by oral hypoglycemic drugs
O24439	ICD-10	Other	Gestational diabetes mellitus in the puerperium, unspecified control
O24811	ICD-10	Other	Other pre-existing diabetes mellitus in pregnancy, first trimester
O24812	ICD-10	Other	Other pre-existing diabetes mellitus in pregnancy, second trimester
O24813	ICD-10	Other	Other pre-existing diabetes mellitus in pregnancy, third trimester



O24819	ICD-10	Other	Other pre-existing diabetes mellitus in pregnancy, unspecified trimester
O2482	ICD-10	Other	Other pre-existing diabetes mellitus in childbirth
O2483	ICD-10	Other	Other pre-existing diabetes mellitus in the puerperium
O24911	ICD-10	Other	Unspecified diabetes mellitus in pregnancy, first trimester
O24912	ICD-10	Other	Unspecified diabetes mellitus in pregnancy, second trimester
O24913	ICD-10	Other	Unspecified diabetes mellitus in pregnancy, third trimester
O24919	ICD-10	Other	Unspecified diabetes mellitus in pregnancy, unspecified trimester
O2492	ICD-10	Other	Unspecified diabetes mellitus in childbirth
O2493	ICD-10	Other	Unspecified diabetes mellitus in the puerperium
P700	ICD-10	Other	Syndrome of infant of mother with gestational diabetes
P701	ICD-10	Other	Syndrome of infant of a diabetic mother
P702	ICD-10	Other	Neonatal diabetes mellitus
V5391	ICD-9	Other	Fitting and adjustment of insulin pump
V5867	ICD-9	Other	Long-term (current) use of insulin
V6546	ICD-9	Other	Encounter for insulin pump training
V8811	ICD-9	Other	Acquired total absence of pancreas
Z4681	ICD-10	Other	Encounter for fitting and adjustment of insulin pump
Z794	ICD-10	Other	Long term (current) use of insulin
Z8631	ICD-10	Other	Personal history of diabetic foot ulcer
Z8632	ICD-10	Other	Personal history of gestational diabetes
Z8639	ICD-10	Other	Personal history of other endocrine, nutritional and metabolic disease
Z90410	ICD-10	Other	Acquired total absence of pancreas

## B. LIST OF NATIONAL DRUG CODES FOR INSULIN

The following table shows NDCs that we used to define regular insulin users.

NDC	GPI Generic Name	Product Name	Active Ingredient	Type
00002821001	Insulin (Regular) Inj 100 Unit/ML	ILETIN I REG	Insulin Regular	Short
54569295101	Insulin (Regular) Inj 100 Unit/ML	ILETIN I REG	Insulin Regular	Short
00002831001	Insulin Isophane Inj 100 Unit/ML	ILETIN I NPH	Insulin Isophane	Intermediate
54569165101	Insulin Isophane Inj 100 Unit/ML	ILETIN I NPH	Insulin Isophane	Intermediate
00002841001	Insulin Zinc Inj 100 Unit/ML	ILETIN I LENTE	Insulin Zinc	Intermediate
00002821101	Insulin Regular (Pork) Inj 100 Unit/ML	ILETIN II REGULAR/PORK	Insulin Regular (Pork)	Short
00002831101	Insulin Isophane (Pork) Inj 100 Unit/ML	ILETIN II NPH/PORK	Insulin Isophane (Pork)	Intermediate
00002841101	Insulin Zinc (Pork) Inj 100 Unit/ML	ILETIN II LENTE/PORK	Insulin Zinc (Pork)	Intermediate
00169320111	Insulin Aspart Inj 100 Unit/ML	FIASP	Insulin Aspart	Rapid
00169750111	Insulin Aspart Inj 100 Unit/ML	NOVOLOG	Insulin Aspart	Rapid
54569658400	Insulin Aspart Inj 100 Unit/ML	NOVOLOG	Insulin Aspart	Rapid
54868277700	Insulin Aspart Inj 100 Unit/ML	NOVOLOG	Insulin Aspart	Rapid
68258896701	Insulin Aspart Inj 100 Unit/ML	NOVOLOG	Insulin Aspart	Rapid
00169320415	Insulin Aspart Soln Pen-injector 100 Unit/ML	FIASP FLEXTOUCH	Insulin Aspart	Rapid
00169633910	Insulin Aspart Soln Pen-injector 100 Unit/ML	NOVOLOG FLEXPEN	Insulin Aspart	Rapid
23490210801	Insulin Aspart Soln Pen-injector 100 Unit/ML	NOVOLOG FLEXPEN	Insulin Aspart	Rapid
54569658700	Insulin Aspart Soln Pen-injector 100 Unit/ML	NOVOLOG FLEXPEN	Insulin Aspart	Rapid
54868605400	Insulin Aspart Soln Pen-injector 100 Unit/ML	NOVOLOG FLEXPEN	Insulin Aspart	Rapid
68258889903	Insulin Aspart Soln Pen-injector 100 Unit/ML	NOVOLOG FLEXPEN	Insulin Aspart	Rapid
00169330312	Insulin Aspart Soln Cartridge 100 Unit/ML	NOVOLOG PENFILL	Insulin Aspart	Rapid
54569658600	Insulin Aspart Soln Cartridge 100 Unit/ML	NOVOLOG PENFILL	Insulin Aspart	Rapid
68258892803	Insulin Aspart Soln Cartridge 100 Unit/ML	NOVOLOG PENFILL	Insulin Aspart	Rapid
00088222033	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
00088502101	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
23490210601	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
49999099410	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
50090087600	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
54569560500	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
54868462600	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
55045368501	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
68115083910	Insulin Glargine Inj 100 Unit/ML	LANTUS	Insulin Glargine	Long-Acting
00002771501	Insulin Glargine Soln Pen-Injector 100 Unit/ML	BASAGLAR KWIKPEN	Insulin Glargine	Long-Acting
00002771559	Insulin Glargine Soln Pen-Injector 100 Unit/ML	BASAGLAR KWIKPEN	Insulin Glargine	Long-Acting
00088221900	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
00088221905	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting

00088222060	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
00088502005	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
50090139800	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
54569646200	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
54569646201	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
54868623100	Insulin Glargine Soln Pen-Injector 100 Unit/ML	LANTUS SOLOSTAR	Insulin Glargine	Long-Acting
00024586901	Insulin Glargine Soln Pen-Injector 300 Unit/ML	TOUJEO SOLOSTAR	Insulin Glargine	Long-Acting
00024586903	Insulin Glargine Soln Pen-Injector 300 Unit/ML	TOUJEO SOLOSTAR	Insulin Glargine	Long-Acting
00024587100	Insulin Glargine Soln Pen-Injector 300 Unit/ML	TOUJEO MAX SOLOSTAR	Insulin Glargine	Long-Acting
00024587102	Insulin Glargine Soln Pen-Injector 300 Unit/ML	TOUJEO MAX SOLOSTAR	Insulin Glargine	Long-Acting
54569662500	Insulin Glargine Soln Pen-Injector 300 Unit/ML	TOUJEO SOLOSTAR	Insulin Glargine	Long-Acting
00088222052	Insulin Glargine Soln Cartridge 100 Unit/ML	LANTUS FOR OPTICLIK	Insulin Glargine	Long-Acting
54868576500	Insulin Glargine Soln Cartridge 100 Unit/ML	LANTUS FOR OPTICLIK	Insulin Glargine	Long-Acting
00088250033	Insulin Glulisine Inj 100 Unit/ML	APIDRA	Insulin Glulisine	Rapid
00088250205	Insulin Glulisine Soln Pen-Injector Inj 100 Unit/ML	APIDRA SOLOSTAR	Insulin Glulisine	Rapid
00088250052	Insulin Glulisine Soln Cartridge Inj 100 Unit/ML	APIDRA	Insulin Glulisine	Rapid
00002751001	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00002751017	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00002751501	Insulin Lispro (Human) Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00002751559	Insulin Lispro (Human) Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00024592410	Insulin Lispro Inj 100 Unit/ML	ADMELOG	Insulin Lispro	Rapid
23490210101	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
35356010200	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
50090137500	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
54569643500	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
54868510800	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
55045360201	Insulin Lispro Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
68115074610	Insulin Lispro (Human) Inj 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00002771401	Insulin Lispro Soln Pen-injector 100 Unit/ML	HUMALOG JUNIOR KWIKPEN	Insulin Lispro	Rapid
00002771459	Insulin Lispro Soln Pen-injector 100 Unit/ML	HUMALOG JUNIOR KWIKPEN	Insulin Lispro	Rapid
00002872501	Insulin Lispro (Human) Soln Pen-injector 100 Unit/ML	HUMALOG PEN	Insulin Lispro	Rapid
00002872559	Insulin Lispro (Human) Soln Pen-injector 100 Unit/ML	HUMALOG PEN	Insulin Lispro	Rapid
00002879901	Insulin Lispro Soln Pen-injector 100 Unit/ML	HUMALOG KWIKPEN	Insulin Lispro	Rapid
00002879959	Insulin Lispro Soln Pen-injector 100 Unit/ML	HUMALOG KWIKPEN	Insulin Lispro	Rapid
00024592500	Insulin Lispro Soln Pen-injector 100 Unit/ML	ADMELOG SOLOSTAR	Insulin Lispro	Rapid
00024592505	Insulin Lispro Soln Pen-injector 100 Unit/ML	ADMELOG SOLOSTAR	Insulin Lispro	Rapid
54569658500	Insulin Lispro Soln Pen-injector 100 Unit/ML	HUMALOG KWIKPEN	Insulin Lispro	Rapid

54868589900	Insulin Lispro (Human) Soln Pen-injector 100 Unit/ML	HUMALOG PEN	Insulin Lispro	Rapid
00002771201	Insulin Lispro Soln Pen-injector 200 Unit/ML	HUMALOG KWIKPEN	Insulin Lispro	Rapid
00002771227	Insulin Lispro Soln Pen-injector 200 Unit/ML	HUMALOG KWIKPEN	Insulin Lispro	Rapid
00002751601	Insulin Lispro Soln Cartridge 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00002751659	Insulin Lispro Soln Cartridge 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
54868583600	Insulin Lispro Soln Cartridge 100 Unit/ML	HUMALOG	Insulin Lispro	Rapid
00169368712	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
23490210701	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
50090127600	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
54569630000	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
54868011200	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
68258897701	Insulin Detemir Inj 100 Unit/ML	LEVEMIR	Insulin Detemir	Long-Acting
00169643810	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXTOUCH	Insulin Detemir	Long-Acting
00169643910	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
23490210401	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
50090147500	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXTOUCH	Insulin Detemir	Long-Acting
54569630100	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
54569630101	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
54569657000	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXTOUCH	Insulin Detemir	Long-Acting
54868588300	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
68258892703	Insulin Detemir Soln Pen-injector 100 Unit/ML	LEVEMIR FLEXPEN	Insulin Detemir	Long-Acting
00169266015	Insulin Degludec Soln Pen-Injector 100 Unit/ML	TRESIBA FLEXTOUCH	Insulin Degludec	Long-Acting
00169255013	Insulin Degludec Soln Pen-Injector 200 Unit/ML	TRESIBA FLEXTOUCH	Insulin Degludec	Long-Acting
00002821501	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
00002821517	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
00002821591	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
00169004471	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R	Insulin Regular (Human)	Short
00169183302	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R RELION	Insulin Regular (Human)	Short
00169183311	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R	Insulin Regular (Human)	Short
00169183317	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R	Insulin Regular (Human)	Short
00169231321	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R INNOLET	Insulin Regular (Human)	Short
00169347318	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R U-100 PENFILL	Insulin Regular (Human)	Short
23490210301	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
50090049700	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R	Insulin Regular (Human)	Short
54569231900	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
54569383300	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R	Insulin Regular (Human)	Short

54569383301	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R U-100	Insulin Regular (Human)	Short
54569383302	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R U-100	Insulin Regular (Human)	Short
54868359800	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R U-100	Insulin Regular (Human)	Short
54868361900	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
55045350601	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
59060183302	Insulin Regular (Human) Inj 100 Unit/ML	RELION R	Insulin Regular (Human)	Short
68115070905	Insulin Regular (Human) Inj 100 Unit/ML	NOVOLIN R U-100 PENFILL	Insulin Regular (Human)	Short
68115072810	Insulin Regular (Human) Inj 100 Unit/ML	HUMULIN R	Insulin Regular (Human)	Short
00002850101	Insulin Regular (Human) Inj 500 Unit/ML	HUMULIN R U-500 (CONCENTR	Insulin Regular (Human)	Short
00069070737	Insulin Regular (Human) Inhalation Powder 1 MG/BLISTER	EXUBERA PATIENT PACK	Insulin Regular (Human)	Short
00069072437	Insulin Regular (Human) Inhalation Powder 3 MG/BLISTER	EXUBERA PATIENT PACK	Insulin Regular (Human)	Short
00024587490	Insulin Regular (Human) Inhalation Powder 4 Unit/Cartridge	AFREZZA	Insulin Regular (Human)	Short
47918087490	Insulin Regular (Human) Inhalation Powder 4 Unit/Cartridge	AFREZZA	Insulin Regular (Human)	Short
47918087890	Insulin Regular (Human) Inhalation Powder 8 Unit/Cartridge	AFREZZA	Insulin Regular (Human)	Short
47918089190	Insulin Regular (Human) Inhalation Powder 12 Unit/Cartridge	AFREZZA	Insulin Regular (Human)	Short
00069005019	Insulin Regular (Human) Inhalation Powder 1 & 3 MG/BLISTER	EXUBERA COMBINATION PACK	Insulin Regular (Human)	Short
00069005053	Insulin Regular (Human) Inhalation Powder 1 & 3 MG/BLISTER	EXUBERA COMBINATION PACK	Insulin Regular (Human)	Short
00069005085	Insulin Regular (Human) Inhalation Powder 1 & 3 MG/BLISTER	EXUBERA KIT	Insulin Regular (Human)	Short
00024588236	Insulin Regular (Human) Inhal Powd 4 (30) & 8 (60) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
47918088236	Insulin Regular (Human) Inhal Powd 4 (30) & 8 (60) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
00024588463	Insulin Regular (Human) Inhal Powd 4 (60) & 8 (30) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
47918088463	Insulin Regular (Human) Inhal Powd 4 (60) & 8 (30) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
47918088018	Insulin Regular (Human) Inhal Powd 4 (90) & 8 (90) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
00024589463	Insulin Regular (Human) Inh Powd 8 (60) & 12 (30) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
47918089463	Insulin Regular (Human) Inh Powd 8 (60) & 12 (30) Unit/Cart	AFREZZA	Insulin Regular (Human)	Short
47918090218	Insulin Regular (Human) Inh Powd 4 & 8 & 12 Unit/Cart (60)	AFREZZA	Insulin Regular (Human)	Short
00002882401	Insulin Regular (Human) Soln Pen-Injector 500 Unit/ML	HUMULIN R U-500 KWIKPEN	Insulin Regular (Human)	Short
00002882427	Insulin Regular (Human) Soln Pen-Injector 500 Unit/ML	HUMULIN R U-500 KWIKPEN	Insulin Regular (Human)	Short
00169007011	Insulin Regular (Human) Inj Buffered 100 Unit/ML	VELOSULIN BR	Insulin Reg (Human) Buffered	Short
00002831501	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
00002831517	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
00002831591	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
00169004571	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate
00169183402	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N RELION	Insulin NPH (Human) (Isophane)	Intermediate
00169183411	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate

00169183417	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate
00169231421	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N INNOLET	Insulin NPH (Human) (Isophane)	Intermediate
00169347418	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N U-100 PENFILL	Insulin NPH (Human) (Isophane)	Intermediate
23490210201	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
50090035200	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
50090049800	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate
54569231800	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
54569383500	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N U-100	Insulin NPH (Human) (Isophane)	Intermediate
54569383501	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N U-100	Insulin NPH (Human) (Isophane)	Intermediate
54569383502	Insulin Isophane (Human) Inj 100 Unit/ML	NOVOLIN N U-100	Insulin NPH (Human) (Isophane)	Intermediate
54868142901	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
54868238001	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate
58016478801	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
59060183402	Insulin Isophane (Human) Inj 100 Unit/ML	RELION N	Insulin NPH (Human) (Isophane)	Intermediate
59060231404	Insulin Isophane (Human) Inj 100 Unit/ML	RELION N INNOLET	Insulin NPH (Human) (Isophane)	Intermediate
68115072905	Insulin Isophane (Human) Inj 100 Unit/ML	HUMULIN N U-100 PEN	Insulin NPH (Human) (Isophane)	Intermediate
68258898501	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	HUMULIN N	Insulin NPH (Human) (Isophane)	Intermediate
68258898601	Insulin NPH (Human) (Isophane) Inj 100 Unit/ML	NOVOLIN N	Insulin NPH (Human) (Isophane)	Intermediate
00002873001	Insulin NPH (Human) (Isophane) Susp Pen-injector 100 Unit/ML	HUMULIN N U-100 PEN	Insulin NPH (Human) (Isophane)	Intermediate
00002873059	Insulin NPH (Human) (Isophane) Susp Pen-injector 100 Unit/ML	HUMULIN N U-100 PEN	Insulin NPH (Human) (Isophane)	Intermediate
00002880501	Insulin NPH (Human) (Isophane) Susp Pen-injector 100 Unit/ML	HUMULIN N KWIKPEN	Insulin NPH (Human) (Isophane)	Intermediate
00002880559	Insulin NPH (Human) (Isophane) Susp Pen-injector 100 Unit/ML	HUMULIN N KWIKPEN	Insulin NPH (Human) (Isophane)	Intermediate
00002841501	Insulin Zinc (Human) Inj 100 Unit/ML	HUMULIN L	Insulin Zinc (Human)	Intermediate
00169183511	Insulin Zinc (Human) Inj 100 Unit/ML	NOVOLIN L	Insulin Zinc (Human)	Intermediate
54569383400	Insulin Zinc (Human) Inj 100 Unit/ML	NOVOLIN L U-100	Insulin Zinc (Human)	Intermediate
00002861501	Insulin Zinc, Extended (Human) Inj 100 Unit/ML	HUMULIN U	Insulin Zinc Extended (Human)	Long-Acting
00169368213	Insulin Aspart Prot & Aspart (Human) Inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30 PENFILL	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
00169368512	Insulin Aspart Prot & Aspart (Human) Inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
23490210501	Insulin Aspart Prot & Aspart (Human) Inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
54569663000	Insulin Aspart Prot & Aspart (Human) Inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
54868520100	Insulin Aspart Prot & Aspart (Human) Inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
00169369619	Insulin Aspart Prot & Aspart Sus Pen-inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30 PREFILL	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate

54569663100	Insulin Aspart Prot & Aspart Sus Pen- inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30 PREFILL	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
54868532700	Insulin Aspart Prot & Aspart Sus Pen- inj 100 Unit/ML (70-30)	NOVOLOG MIX 70/30 PREFILL	Insulin Aspart Protamine & Aspart (Human)	Rapid/Intermediate
00002751101	Insulin Lispro Prot & Lispro Inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
54569532100	Insulin Lispro Prot & Lispro Inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
54868438100	Insulin Lispro Prot & Lispro Inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
68258598301	Insulin Lispro Prot & Lispro Inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002751201	Insulin Lispro Protamine & Lispro Inj 100 Unit/ML (50-50)	HUMALOG MIX 50/50	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879401	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25 PEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879459	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25 PEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879701	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25 KWIKPEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879759	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (75-25)	HUMALOG MIX 75/25 KWIKPEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879301	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (50-50)	HUMALOG MIX 50/50 PEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879359	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (50-50)	HUMALOG MIX 50/50 PEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879801	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (50-50)	HUMALOG MIX 50/50 KWIKPEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002879859	Insulin Lispro Prot & Lispro Sus Pen- inj 100 Unit/ML (50-50)	HUMALOG MIX 50/50 KWIKPEN	Insulin Lispro Protamine & Lispro	Rapid/Intermediate
00002871501	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002871517	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002871591	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169001771	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169183702	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30 RELION	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169183711	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169183717	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169231721	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30 INNOLET	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169347718	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30 PENFILL	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
49999099310	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
50090040300	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54569291800	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54569291801	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54569291802	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54569346700	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54569346701	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54868274600	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54868347400	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
55045350801	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	NOVOLIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate

55045362401	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (70-30)	HUMULIN 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
59060183702	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	RELION 70/30	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
59060231704	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (70-30)	RELION 70/30 INNOLET	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002951501	Insulin Isophane & Regular (Human) Inj 100 Unit/ML (50-50)	HUMULIN 50/50	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
54868582400	Insulin NPH Isophane & Regular Human Inj 100 Unit/ML (50-50)	HUMULIN 50/50	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002877001	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	HUMULIN 70/30 PEN	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002877059	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	HUMULIN 70/30 PEN	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002880301	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	HUMULIN 70/30 KWIKPEN	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00002880359	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	HUMULIN 70/30 KWIKPEN	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169300715	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	NOVOLIN 70/30 FLEXPEN	Insulin NPH Isophane & Reg (Human)	Short/Intermediate
00169300725	Insulin NPH & Regular Susp Pen-Inj 100 Unit/ML (70-30)	NOVOLIN 70/30 FLEXPEN REL	Insulin NPH Isophane & Reg (Human)	Short/Intermediate



### C. DISTRIBUTION OF WEEKLY INSULIN DOSAGE

The table below shows the distribution of weekly insulin dosage. The threshold that we selected for our analysis – 280 units – is slightly above the 40<sup>th</sup> percentile.

Percentile	Weekly Insulin Dosage
Mean	433
Min	0
1th	45
5th	91
10th	127
20th	183
30th	230
40th	277
50th	337
60th	407
70th	487
80th	612
90th	837
95th	1,095
99th	1,819
Max	9,222

D. HCPCS CODES FOR DIABETIC TESTING SUPPLIES

This list includes eight HCPCS codes for diabetic testing supplies subject to competitive bidding and non-competitively bid E0607. Modifier “KL” is used to indicate that the product is mail-order.

HCPCS Code	HCPCS Code Description
A4233	Replacement Battery, Alkaline (Other Than J Cell), For Use With Medically Necessary Home Blood Glucose Monitor Owned By Patient, Each
A4234	Replacement Battery, Alkaline, J Cell, For Use With Medically Necessary Home Blood Glucose Monitor Owned By Patient, Each
A4235	Replacement Battery, Lithium, For Use With Medically Necessary Home Blood Glucose Monitor Owned By Patient, Each
A4236	Replacement Battery, Silver Oxide, For Use With Medically Necessary Home Blood Glucose Monitor Owned By Patient, Each
A4253	Blood Glucose Test Or Reagent Strips For Home Blood Glucose Monitor, Per 50 Strips
A4256	Normal, Low And High Calibrator Solution / Chips
A4258	Spring-Powered Device For Lancet, Each
A4259	Lancets, Per Box Of 100
E0607	Blood Glucose Monitor

## E. LIST OF DIAGNOSIS CODES FOR DEFINING DIABETES-RELATED OUTCOMES

The following table includes all ICD diagnosis codes that we used to define diabetes-related hospitalization and ER rates. It is developed based on the diseases hierarchies incorporated in the CMS-HCC Model. Specifically, we used ICD codes of three disease hierarchies: HCC 17 (Diabetes with Acute Complications), HCC 18 (Diabetes with Chronic Complications), and HCC 19 (Diabetes without Complication). In addition, codes with an asterisk (\*) are used to define ketoacidosis-related health outcomes.

ICD Code	ICD	HCC	Description
24910	ICD-9	DB Acute (17)	Secondary diabetes mellitus with ketoacidosis, not stated as uncontrolled, or unspecified
24911	ICD-9	DB Acute (17)	Secondary diabetes mellitus with ketoacidosis, uncontrolled
24920	ICD-9	DB Acute (17)	Secondary diabetes mellitus with hyperosmolarity, not stated as uncontrolled, or unspecified
24921	ICD-9	DB Acute (17)	Secondary diabetes mellitus with hyperosmolarity, uncontrolled
24930	ICD-9	DB Acute (17)	Secondary diabetes mellitus with other coma, not stated as uncontrolled, or unspecified
24931	ICD-9	DB Acute (17)	Secondary diabetes mellitus with other coma, uncontrolled
25010*	ICD-9	DB Acute (17)	Diabetes with ketoacidosis, type II or unspecified type, not stated as uncontrolled
25011*	ICD-9	DB Acute (17)	Diabetes with ketoacidosis, type I [juvenile type], not stated as uncontrolled
25012*	ICD-9	DB Acute (17)	Diabetes with ketoacidosis, type II or unspecified type, uncontrolled
25013*	ICD-9	DB Acute (17)	Diabetes with ketoacidosis, type I [juvenile type], uncontrolled
25020	ICD-9	DB Acute (17)	Diabetes with hyperosmolarity, type II or unspecified type, not stated as uncontrolled
25021	ICD-9	DB Acute (17)	Diabetes with hyperosmolarity, type I [juvenile type], not stated as uncontrolled
25022	ICD-9	DB Acute (17)	Diabetes with hyperosmolarity, type II or unspecified type, uncontrolled
25023	ICD-9	DB Acute (17)	Diabetes with hyperosmolarity, type I [juvenile type], uncontrolled
25030	ICD-9	DB Acute (17)	Diabetes with other coma, type II or unspecified type, not stated as uncontrolled
25031	ICD-9	DB Acute (17)	Diabetes with other coma, type I [juvenile type], not stated as uncontrolled
25032	ICD-9	DB Acute (17)	Diabetes with other coma, type II or unspecified type, uncontrolled
25033	ICD-9	DB Acute (17)	Diabetes with other coma, type I [juvenile type], uncontrolled
E0800	ICD-10	DB Acute (17)	Diabetes mellitus due to underlying condition with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E0801	ICD-10	DB Acute (17)	Diabetes mellitus due to underlying condition with hyperosmolarity with coma
E0810	ICD-10	DB Acute (17)	Diabetes mellitus due to underlying condition with diabetic nephropathy
E0811	ICD-10	DB Acute (17)	Diabetes mellitus due to underlying condition with diabetic chronic kidney disease
E08641	ICD-10	DB Acute (17)	Diabetes mellitus due to underlying condition with hypoglycemia with coma

E0900	ICD-10	DB Acute (17)	Drug or chemical induced diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E0901	ICD-10	DB Acute (17)	Drug or chemical induced diabetes mellitus with hyperosmolarity with coma
E0910	ICD-10	DB Acute (17)	Drug or chemical induced diabetes mellitus with ketoacidosis without coma
E0911	ICD-10	DB Acute (17)	Drug or chemical induced diabetes mellitus with ketoacidosis with coma
E09641	ICD-10	DB Acute (17)	Drug or chemical induced diabetes mellitus with hypoglycemia with coma
E1010*	ICD-10	DB Acute (17)	Type 1 diabetes mellitus with ketoacidosis without coma
E1011*	ICD-10	DB Acute (17)	Type 1 diabetes mellitus with ketoacidosis with coma
E10641	ICD-10	DB Acute (17)	Type 1 diabetes mellitus with hypoglycemia with coma
E1100	ICD-10	DB Acute (17)	Type 2 diabetes mellitus with hyperosmolarity without nonketotic hyperglycemic-hyperosmolar coma (NKHHC)
E1101	ICD-10	DB Acute (17)	Type 2 diabetes mellitus with hyperosmolarity with coma
E1110*	ICD-10	DB Acute (17)	Type 2 diabetes mellitus with ketoacidosis without coma
E1111*	ICD-10	DB Acute (17)	Type 2 diabetes mellitus with ketoacidosis with coma
E11641	ICD-10	DB Acute (17)	Type 2 diabetes mellitus with hypoglycemia with coma
24940	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with renal manifestations, not stated as uncontrolled, or unspecified
24941	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with renal manifestations, uncontrolled
24950	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with ophthalmic manifestations, not stated as uncontrolled, or unspecified
24951	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with ophthalmic manifestations, uncontrolled
24960	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with neurological manifestations, not stated as uncontrolled, or unspecified
24961	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with neurological manifestations, uncontrolled
24970	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with peripheral circulatory disorders, not stated as uncontrolled, or unspecified
24971	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with peripheral circulatory disorders, uncontrolled
24980	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with other specified manifestations, not stated as uncontrolled, or unspecified
24981	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with other specified manifestations, uncontrolled
24990	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with unspecified complication, not stated as uncontrolled, or unspecified
24991	ICD-9	DB Chronic (18)	Secondary diabetes mellitus with unspecified complication, uncontrolled
25040	ICD-9	DB Chronic (18)	Diabetes with renal manifestations, type II or unspecified type, not stated as uncontrolled
25041	ICD-9	DB Chronic (18)	Diabetes with renal manifestations, type I [juvenile type], not stated as uncontrolled
25042	ICD-9	DB Chronic (18)	Diabetes with renal manifestations, type II or unspecified type, uncontrolled
25043	ICD-9	DB Chronic (18)	Diabetes with renal manifestations, type I [juvenile type], uncontrolled

25050	ICD-9	DB Chronic (18)	Diabetes with ophthalmic manifestations, type II or unspecified type, not stated as uncontrolled
25051	ICD-9	DB Chronic (18)	Diabetes with ophthalmic manifestations, type I [juvenile type], not stated as uncontrolled
25052	ICD-9	DB Chronic (18)	Diabetes with ophthalmic manifestations, type II or unspecified type, uncontrolled
25053	ICD-9	DB Chronic (18)	Diabetes with ophthalmic manifestations, type I [juvenile type], uncontrolled
25060	ICD-9	DB Chronic (18)	Diabetes with neurological manifestations, type II or unspecified type, not stated as uncontrolled
25061	ICD-9	DB Chronic (18)	Diabetes with neurological manifestations, type I [juvenile type], not stated as uncontrolled
25062	ICD-9	DB Chronic (18)	Diabetes with neurological manifestations, type II or unspecified type, uncontrolled
25063	ICD-9	DB Chronic (18)	Diabetes with neurological manifestations, type I [juvenile type], uncontrolled
25070	ICD-9	DB Chronic (18)	Diabetes with peripheral circulatory disorders, type II or unspecified type, not stated as uncontrolled
25071	ICD-9	DB Chronic (18)	Diabetes with peripheral circulatory disorders, type I [juvenile type], not stated as uncontrolled
25072	ICD-9	DB Chronic (18)	Diabetes with peripheral circulatory disorders, type II or unspecified type, uncontrolled
25073	ICD-9	DB Chronic (18)	Diabetes with peripheral circulatory disorders, type I [juvenile type], uncontrolled
25080	ICD-9	DB Chronic (18)	Diabetes with other specified manifestations, type II or unspecified type, not stated as uncontrolled
25081	ICD-9	DB Chronic (18)	Diabetes with other specified manifestations, type I [juvenile type], not stated as uncontrolled
25082	ICD-9	DB Chronic (18)	Diabetes with other specified manifestations, type II or unspecified type, uncontrolled
25083	ICD-9	DB Chronic (18)	Diabetes with other specified manifestations, type I [juvenile type], uncontrolled
25090	ICD-9	DB Chronic (18)	Diabetes with unspecified complication, type II or unspecified type, not stated as uncontrolled
25091	ICD-9	DB Chronic (18)	Diabetes with unspecified complication, type I [juvenile type], not stated as uncontrolled
25092	ICD-9	DB Chronic (18)	Diabetes with unspecified complication, type II or unspecified type, uncontrolled
25093	ICD-9	DB Chronic (18)	Diabetes with unspecified complication, type I [juvenile type], uncontrolled
E0821	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic nephropathy
E0822	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic chronic kidney disease
E0829	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other diabetic kidney complication
E08311	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with unspecified diabetic retinopathy with macular edema
E08319	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with unspecified diabetic retinopathy without macular edema
E083211	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, right eye
E083212	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, left eye
E083213	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E083219	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye

E083291	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, right eye
E083292	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, left eye
E083293	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E083299	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E083311	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E083312	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E083313	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E083319	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E083391	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E083392	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E083393	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E083399	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E083411	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, right eye
E083412	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, left eye
E083413	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E083419	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E083491	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, right eye
E083492	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, left eye
E083493	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E083499	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E083511	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, right eye
E083512	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, left eye
E083513	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, bilateral
E083519	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with macular edema, unspecified eye
E083521	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E083522	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E083523	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E083529	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E083531	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye

E083532	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E083533	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E083539	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E083541	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E083542	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E083543	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E083549	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E083551	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, right eye
E083552	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, left eye
E083553	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, bilateral
E083559	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with stable proliferative diabetic retinopathy, unspecified eye
E083591	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, right eye
E083592	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, left eye
E083593	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, bilateral
E083599	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with proliferative diabetic retinopathy without macular edema, unspecified eye
E0836	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic cataract
E0837X1	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, right eye
E0837X2	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, left eye
E0837X3	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, bilateral
E0837X9	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic macular edema, resolved following treatment, unspecified eye
E0839	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other diabetic ophthalmic complication
E0840	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic neuropathy, unspecified
E0841	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic mononeuropathy
E0842	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic polyneuropathy
E0843	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic autonomic (poly)neuropathy
E0844	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic amyotrophy
E0849	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other diabetic neurological complication
E0851	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic peripheral angiopathy without gangrene

E0852	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic peripheral angiopathy with gangrene
E0859	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other circulatory complications
E08610	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic neuropathic arthropathy
E08618	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other diabetic arthropathy
E08620	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with diabetic dermatitis
E08621	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with foot ulcer
E08622	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other skin ulcer
E08628	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other skin complications
E08630	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with periodontal disease
E08638	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other oral complications
E08649	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with hypoglycemia without coma
E0865	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with hyperglycemia
E0869	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with other specified complication
E088	ICD-10	DB Chronic (18)	Diabetes mellitus due to underlying condition with unspecified complications
E0921	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic nephropathy
E0922	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic chronic kidney disease
E0929	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other diabetic kidney complication
E09311	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with unspecified diabetic retinopathy with macular edema
E09319	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with unspecified diabetic retinopathy without macular edema
E093211	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E093212	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E093213	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E093219	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E093291	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E093292	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E093293	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E093299	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E093311	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E093312	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye



E093313	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E093319	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E093391	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E093392	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E093393	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E093399	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E093411	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E093412	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E093413	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E093419	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E093491	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E093492	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E093493	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E093499	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E093511	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E093512	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E093513	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E093519	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E093521	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E093522	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E093523	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E093529	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E093531	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E093532	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E093533	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E093539	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E093541	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E093542	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E093543	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E093549	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E093551	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E093552	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E093553	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E093559	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E093591	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E093592	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E093593	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E093599	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E0936	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic cataract
E0937X1	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E0937X2	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E0937X3	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E0937X9	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E0939	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other diabetic ophthalmic complication
E0940	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with diabetic neuropathy, unspecified
E0941	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with diabetic mononeuropathy
E0942	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with diabetic polyneuropathy
E0943	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with diabetic autonomic (poly)neuropathy
E0944	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with diabetic amyotrophy
E0949	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with neurological complications with other diabetic neurological complication
E0951	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic peripheral angiopathy without gangrene
E0952	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic peripheral angiopathy with gangrene
E0959	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other circulatory complications
E09610	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic neuropathic arthropathy
E09618	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other diabetic arthropathy
E09620	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with diabetic dermatitis
E09621	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with foot ulcer
E09622	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other skin ulcer

E09628	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other skin complications
E09630	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with periodontal disease
E09638	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other oral complications
E09649	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with hypoglycemia without coma
E0965	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with hyperglycemia
E0969	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with other specified complication
E098	ICD-10	DB Chronic (18)	Drug or chemical induced diabetes mellitus with unspecified complications
E1021	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic nephropathy
E1022	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic chronic kidney disease
E1029	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other diabetic kidney complication
E10311	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with unspecified diabetic retinopathy with macular edema
E10319	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with unspecified diabetic retinopathy without macular edema
E10321	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E103211	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E103212	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E103213	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E103219	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10329	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E103291	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E103292	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E103293	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E103299	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10331	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E103311	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E103312	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E103313	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E103319	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10339	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema
E103391	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye

E103392	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E103393	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E103399	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10341	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E103411	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E103412	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E103413	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E103419	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E10349	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E103491	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E103492	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E103493	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E103499	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E10351	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema
E103511	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E103512	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E103513	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E103519	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E103521	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E103522	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E103523	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E103529	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E103531	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E103532	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E103533	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E103539	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E103541	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E103542	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye
E103543	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral

E103549	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E103551	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E103552	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E103553	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E103559	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E10359	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema
E103591	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E103592	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E103593	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E103599	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1036	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic cataract
E1037X1	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1037X2	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1037X3	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1037X9	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1039	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other diabetic ophthalmic complication
E1040	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic neuropathy, unspecified
E1041	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic mononeuropathy
E1042	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic polyneuropathy
E1043	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic autonomic (poly)neuropathy
E1044	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic amyotrophy
E1049	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other diabetic neurological complication
E1051	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1052	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1059	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other circulatory complications
E10610	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic neuropathic arthropathy
E10618	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other diabetic arthropathy
E10620	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with diabetic dermatitis
E10621	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with foot ulcer

E10622	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other skin ulcer
E10628	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other skin complications
E10630	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with periodontal disease
E10638	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other oral complications
E10649	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with hypoglycemia without coma
E1065	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with hyperglycemia
E1069	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with other specified complication
E108	ICD-10	DB Chronic (18)	Type 1 diabetes mellitus with unspecified complications
E1121	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic nephropathy
E1122	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic chronic kidney disease
E1129	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other diabetic kidney complication
E11311	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with unspecified diabetic retinopathy with macular edema
E11319	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with unspecified diabetic retinopathy without macular edema
E11321	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema
E113211	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, right eye
E113212	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, left eye
E113213	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, bilateral
E113219	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy with macular edema, unspecified eye
E11329	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema
E113291	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, right eye
E113292	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, left eye
E113293	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, bilateral
E113299	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with mild nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11331	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema
E113311	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, right eye
E113312	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, left eye
E113313	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, bilateral
E113319	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy with macular edema, unspecified eye
E11339	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema

E113391	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, right eye
E113392	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, left eye
E113393	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, bilateral
E113399	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with moderate nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11341	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema
E113411	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, right eye
E113412	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, left eye
E113413	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, bilateral
E113419	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy with macular edema, unspecified eye
E11349	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema
E113491	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, right eye
E113492	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, left eye
E113493	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, bilateral
E113499	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with severe nonproliferative diabetic retinopathy without macular edema, unspecified eye
E11351	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema
E113511	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, right eye
E113512	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, left eye
E113513	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, bilateral
E113519	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with macular edema, unspecified eye
E113521	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, right eye
E113522	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, left eye
E113523	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, bilateral
E113529	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment involving the macula, unspecified eye
E113531	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, right eye
E113532	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, left eye
E113533	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, bilateral
E113539	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with traction retinal detachment not involving the macula, unspecified eye
E113541	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, right eye
E113542	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, left eye

E113543	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, bilateral
E113549	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy with combined traction retinal detachment and rhegmatogenous retinal detachment, unspecified eye
E113551	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, right eye
E113552	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, left eye
E113553	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, bilateral
E113559	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with stable proliferative diabetic retinopathy, unspecified eye
E11359	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema
E113591	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, right eye
E113592	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, left eye
E113593	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, bilateral
E113599	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with proliferative diabetic retinopathy without macular edema, unspecified eye
E1136	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic cataract
E1137X1	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, right eye
E1137X2	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, left eye
E1137X3	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, bilateral
E1137X9	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic macular edema, resolved following treatment, unspecified eye
E1139	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other diabetic ophthalmic complication
E1140	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic neuropathy, unspecified
E1141	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic mononeuropathy
E1142	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic polyneuropathy
E1143	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic autonomic (poly)neuropathy
E1144	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic amyotrophy
E1149	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other diabetic neurological complication
E1151	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene
E1152	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic peripheral angiopathy with gangrene
E1159	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other circulatory complications
E11610	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic neuropathic arthropathy
E11618	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other diabetic arthropathy
E11620	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with diabetic dermatitis



E11621	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with foot ulcer
E11622	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other skin ulcer
E11628	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other skin complications
E11630	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with periodontal disease
E11638	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other oral complications
E11649	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with hypoglycemia without coma
E1165	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with hyperglycemia
E1169	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with other specified complication
E118	ICD-10	DB Chronic (18)	Type 2 diabetes mellitus with unspecified complications
24900	ICD-9	DB w/o Complication (19)	Secondary diabetes mellitus without mention of complication, not stated as uncontrolled, or unspecified
24901	ICD-9	DB w/o Complication (19)	Secondary diabetes mellitus without mention of complication, uncontrolled
25002	ICD-9	DB w/o Complication (19)	Diabetes mellitus without mention of complication, type II or unspecified type, uncontrolled
25003	ICD-9	DB w/o Complication (19)	Diabetes mellitus without mention of complication, type I [juvenile type], uncontrolled
E089	ICD-10	DB w/o Complication (19)	Diabetes mellitus due to underlying condition without complications
E099	ICD-10	DB w/o Complication (19)	Drug or chemical induced diabetes mellitus without complications
V5867	ICD-9	DB w/o Complication (19)	Long term (current) use of insulin
Z794	ICD-10	DB w/o Complication (19)	Long term (current) use of insulin

## F. LOGIT REGRESSION ESTIMATES

The tables below provide a series of regression estimates, including coefficients, p-values, and standard errors, and 95-percent confidence intervals for each predictor variable in the logit model.

*Table F-1. Logit Model – Mortality*

Outcome	95% CI					
	Mortality	Coefficient	Standard Error	P-value	Lower Bound	Upper Bound
<b>Period</b>						
Period 1: 2010/01/18-2010/02/14 (reference group)	(omitted)					
Period 2: 2010/02/15-2010/03/14	-0.0132	0.0291	0.6489	-0.0702	0.0437	
Period 3: 2010/03/15-2010/04/11	-0.0850	0.0295	0.0040	-0.1429	-0.0271	
Period 4: 2010/04/12-2010/05/09	-0.1421	0.0298	0.0000	-0.2006	-0.0836	
Period 5: 2010/05/10-2010/06/06	-0.1731	0.0300	0.0000	-0.2319	-0.1143	
Period 6: 2010/06/07-2010/07/04	-0.2264	0.0304	0.0000	-0.2859	-0.1668	
Period 7: 2010/07/05-2010/08/01	-0.2087	0.0302	0.0000	-0.2679	-0.1495	
Period 8: 2010/08/02-2010/08/29	-0.2349	0.0304	0.0000	-0.2944	-0.1753	
Period 9: 2010/08/30-2010/09/26	-0.2377	0.0304	0.0000	-0.2973	-0.1782	
Period 10: 2010/09/27-2010/10/24	-0.1636	0.0298	0.0000	-0.2220	-0.1052	
Period 11: 2010/10/25-2010/11/21	-0.1095	0.0294	0.0002	-0.1671	-0.0520	
Period 12: 2010/11/22-2010/12/19	-0.0849	0.0292	0.0036	-0.1421	-0.0277	
Period 13: 2010/12/20-2011/01/16	0.0066	0.0286	0.8184	-0.0495	0.0626	
Period 14: 2011/01/17-2011/02/13	0.0073	0.0285	0.7984	-0.0486	0.0631	
Period 15: 2011/02/14-2011/03/13	-0.0114	0.0286	0.6914	-0.0675	0.0448	
Period 16: 2011/03/14-2011/04/10	-0.1073	0.0292	0.0002	-0.1646	-0.0499	
Period 17: 2011/04/11-2011/05/08	-0.1348	0.0293	0.0000	-0.1922	-0.0774	
Period 18: 2011/05/09-2011/06/05	-0.2020	0.0297	0.0000	-0.2602	-0.1437	
Period 19: 2011/06/06-2011/07/03	-0.1963	0.0296	0.0000	-0.2543	-0.1382	
Period 20: 2011/07/04-2011/07/31	-0.2322	0.0298	0.0000	-0.2907	-0.1737	
Period 21: 2011/08/01-2011/08/28	-0.2740	0.0301	0.0000	-0.3331	-0.2150	
Period 22: 2011/08/29-2011/09/25	-0.2389	0.0298	0.0000	-0.2974	-0.1804	
Period 23: 2011/09/26-2011/10/23	-0.2114	0.0296	0.0000	-0.2695	-0.1534	
Period 24: 2011/10/24-2011/11/20	-0.1888	0.0294	0.0000	-0.2464	-0.1311	
Period 25: 2011/11/21-2011/12/18	-0.1407	0.0290	0.0000	-0.1977	-0.0838	
Period 26: 2011/12/19-2012/01/15	-0.0969	0.0288	0.0008	-0.1533	-0.0405	
Period 27: 2012/01/16-2012/02/12	-0.1151	0.0289	0.0001	-0.1717	-0.0585	
Period 28: 2012/02/13-2012/03/11	-0.1033	0.0288	0.0003	-0.1598	-0.0467	
Period 29: 2012/03/12-2012/04/08	-0.1515	0.0292	0.0000	-0.2087	-0.0944	
Period 30: 2012/04/09-2012/05/06	-0.2300	0.0296	0.0000	-0.2880	-0.1719	
Period 31: 2012/05/07-2012/06/03	-0.2688	0.0298	0.0000	-0.3273	-0.2104	
Period 32: 2012/06/04-2012/07/01	-0.2116	0.0293	0.0000	-0.2691	-0.1542	

Period 33: 2012/07/02-2012/07/29	-0.3071	0.0300	0.0000	-0.3658	-0.2483
Period 34: 2012/07/30-2012/08/26	-0.2874	0.0298	0.0000	-0.3458	-0.2291
Period 35: 2012/08/27-2012/09/23	-0.2695	0.0296	0.0000	-0.3275	-0.2114
Period 36: 2012/09/24-2012/10/21	-0.2221	0.0292	0.0000	-0.2794	-0.1648
Period 37: 2012/10/22-2012/11/18	-0.2518	0.0294	0.0000	-0.3095	-0.1941
Period 38: 2012/11/19-2012/12/16	-0.1391	0.0286	0.0000	-0.1952	-0.0831
Period 39: 2012/12/17-2013/01/13	-0.0018	0.0278	0.9471	-0.0563	0.0526
Period 40: 2013/01/14-2013/02/10	-0.0189	0.0279	0.4971	-0.0736	0.0357
Period 41: 2013/02/11-2013/03/10	-0.0731	0.0283	0.0098	-0.1285	-0.0176
Period 42: 2013/03/11-2013/04/07	-0.1545	0.0288	0.0000	-0.2110	-0.0981
Period 43: 2013/04/08-2013/05/05	-0.2549	0.0292	0.0000	-0.3121	-0.1977
Period 44: 2013/05/06-2013/06/02	-0.3178	0.0294	0.0000	-0.3755	-0.2602
Period 45: 2013/06/03-2013/06/30	-0.3584	0.0295	0.0000	-0.4163	-0.3004
Period 46: 2013/07/01-2013/07/28	-0.3650	0.0295	0.0000	-0.4228	-0.3072
Period 47: 2013/07/29-2013/08/25	-0.3922	0.0297	0.0000	-0.4503	-0.3340
Period 48: 2013/08/26-2013/09/22	-0.3632	0.0294	0.0000	-0.4209	-0.3056
Period 49: 2013/09/23-2013/10/20	-0.3475	0.0293	0.0000	-0.4048	-0.2902
Period 50: 2013/10/21-2013/11/17	-0.3211	0.0290	0.0000	-0.3780	-0.2642
Period 51: 2013/11/18-2013/12/15	-0.2588	0.0286	0.0000	-0.3149	-0.2028
Period 52: 2013/12/16-2014/01/12	-0.1735	0.0282	0.0000	-0.2287	-0.1183
Period 53: 2014/01/13-2014/02/09	-0.1946	0.0282	0.0000	-0.2500	-0.1393
Period 54: 2014/02/10-2014/03/09	-0.1992	0.0283	0.0000	-0.2546	-0.1437
Period 55: 2014/03/10-2014/04/06	-0.2459	0.0286	0.0000	-0.3020	-0.1899
Period 56: 2014/04/07-2014/05/04	-0.2943	0.0288	0.0000	-0.3508	-0.2379
Period 57: 2014/05/05-2014/06/01	-0.3345	0.0291	0.0000	-0.3915	-0.2775
Period 58: 2014/06/02-2014/06/29	-0.3982	0.0295	0.0000	-0.4561	-0.3403
Period 59: 2014/06/30-2014/07/27	-0.4207	0.0297	0.0000	-0.4789	-0.3624
Period 60: 2014/07/28-2014/08/24	-0.3973	0.0295	0.0000	-0.4552	-0.3394
Period 61: 2014/08/25-2014/09/21	-0.4472	0.0299	0.0000	-0.5058	-0.3885
Period 62: 2014/09/22-2014/10/19	-0.3753	0.0294	0.0000	-0.4329	-0.3177
Period 63: 2014/10/20-2014/11/16	-0.3164	0.0289	0.0000	-0.3732	-0.2597
Period 64: 2014/11/17-2014/12/14	-0.2392	0.0284	0.0000	-0.2949	-0.1835
Period 65: 2014/12/15-2015/01/11	-0.1046	0.0277	0.0002	-0.1589	-0.0504
Period 66: 2015/01/12-2015/02/08	-0.1385	0.0278	0.0000	-0.1931	-0.0839
Period 67: 2015/02/09-2015/03/08	-0.1470	0.0279	0.0000	-0.2017	-0.0923
Period 68: 2015/03/09-2015/04/05	-0.3071	0.0290	0.0000	-0.3640	-0.2503
Period 69: 2015/04/06-2015/05/03	-0.3087	0.0289	0.0000	-0.3653	-0.2520
Period 70: 2015/05/04-2015/05/31	-0.3292	0.0290	0.0000	-0.3861	-0.2724
Period 71: 2015/06/01-2015/06/28	-0.3894	0.0295	0.0000	-0.4472	-0.3317
Period 72: 2015/06/29-2015/07/26	-0.4110	0.0297	0.0000	-0.4692	-0.3529
Period 73: 2015/07/27-2015/08/23	-0.4727	0.0301	0.0000	-0.5318	-0.4137

**Age**

65-74 (reference group) (omitted)

75-84	0.6927	0.0063	0.0000	0.6803	0.7051
<65	-0.1709	0.0072	0.0000	-0.1850	-0.1568
>=85	1.6177	0.0070	0.0000	1.6041	1.6314
<b>Race</b>					
Black (reference group)	(omitted)				
Hispanic	-0.1701	0.0164	0.0000	-0.2022	-0.1380
Other	-0.0455	0.0141	0.0012	-0.0730	-0.0179
White	0.1384	0.0076	0.0000	0.1236	0.1533
<b>Gender</b>					
Female (reference group)	(omitted)				
Male	0.1725	0.0050	0.0000	0.1627	0.1822
Constant	-5.5455	0.0220	0.0000	-5.5885	-5.5024

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Table F-2: Logit Model – Diabetes-Related Hospitalization

Outcome	95% CI					
	Diabetes-Related Hospitalization	Coefficient	Standard Error	P-value	Lower Bound	Upper Bound
<b>Period</b>						
Period 1: 2010/01/18-2010/02/14 (reference group)	(omitted)					
Period 2: 2010/02/15-2010/03/14	-0.0272	0.0350	0.4365	-0.0958	0.0414	
Period 3: 2010/03/15-2010/04/11	-0.0057	0.0348	0.8698	-0.0738	0.0624	
Period 4: 2010/04/12-2010/05/09	0.0186	0.0344	0.5886	-0.0488	0.0860	
Period 5: 2010/05/10-2010/06/06	0.0078	0.0344	0.8214	-0.0597	0.0752	
Period 6: 2010/06/07-2010/07/04	-0.0253	0.0346	0.4656	-0.0932	0.0426	
Period 7: 2010/07/05-2010/08/01	0.0052	0.0343	0.8803	-0.0621	0.0725	
Period 8: 2010/08/02-2010/08/29	-0.0234	0.0345	0.4984	-0.0910	0.0443	
Period 9: 2010/08/30-2010/09/26	0.0001	0.0343	0.9967	-0.0671	0.0674	
Period 10: 2010/09/27-2010/10/24	-0.0007	0.0343	0.9844	-0.0679	0.0665	
Period 11: 2010/10/25-2010/11/21	-0.0115	0.0343	0.7375	-0.0788	0.0558	
Period 12: 2010/11/22-2010/12/19	-0.0578	0.0347	0.0957	-0.1258	0.0102	
Period 13: 2010/12/20-2011/01/16	-0.0302	0.0345	0.3819	-0.0979	0.0375	
Period 14: 2011/01/17-2011/02/13	0.0168	0.0340	0.6212	-0.0499	0.0835	
Period 15: 2011/02/14-2011/03/13	-0.0295	0.0344	0.3921	-0.0969	0.0380	
Period 16: 2011/03/14-2011/04/10	-0.0619	0.0346	0.0737	-0.1298	0.0059	
Period 17: 2011/04/11-2011/05/08	-0.0258	0.0342	0.4503	-0.0928	0.0412	
Period 18: 2011/05/09-2011/06/05	-0.0432	0.0342	0.2068	-0.1103	0.0239	
Period 19: 2011/06/06-2011/07/03	-0.0077	0.0339	0.8201	-0.0742	0.0587	
Period 20: 2011/07/04-2011/07/31	-0.0284	0.0340	0.4036	-0.0950	0.0382	
Period 21: 2011/08/01-2011/08/28	-0.0380	0.0340	0.2646	-0.1047	0.0287	
Period 22: 2011/08/29-2011/09/25	-0.0641	0.0342	0.0610	-0.1311	0.0030	
Period 23: 2011/09/26-2011/10/23	-0.0586	0.0341	0.0860	-0.1255	0.0083	
Period 24: 2011/10/24-2011/11/20	-0.0582	0.0341	0.0879	-0.1249	0.0086	
Period 25: 2011/11/21-2011/12/18	-0.0679	0.0341	0.0465	-0.1348	-0.0010	
Period 26: 2011/12/19-2012/01/15	-0.0620	0.0341	0.0694	-0.1289	0.0049	
Period 27: 2012/01/16-2012/02/12	-0.0421	0.0340	0.2147	-0.1087	0.0244	
Period 28: 2012/02/13-2012/03/11	-0.0721	0.0342	0.0354	-0.1392	-0.0049	
Period 29: 2012/03/12-2012/04/08	-0.1060	0.0345	0.0021	-0.1737	-0.0384	
Period 30: 2012/04/09-2012/05/06	-0.1149	0.0345	0.0009	-0.1825	-0.0474	
Period 31: 2012/05/07-2012/06/03	-0.0821	0.0341	0.0161	-0.1489	-0.0152	
Period 32: 2012/06/04-2012/07/01	-0.1446	0.0345	0.0000	-0.2123	-0.0769	
Period 33: 2012/07/02-2012/07/29	-0.1005	0.0341	0.0032	-0.1673	-0.0337	
Period 34: 2012/07/30-2012/08/26	-0.0972	0.0340	0.0043	-0.1639	-0.0305	
Period 35: 2012/08/27-2012/09/23	-0.1169	0.0341	0.0006	-0.1839	-0.0500	
Period 36: 2012/09/24-2012/10/21	-0.0821	0.0338	0.0152	-0.1485	-0.0158	

Period 37: 2012/10/22-2012/11/18	-0.1141	0.0341	0.0008	-0.1809	-0.0474
Period 38: 2012/11/19-2012/12/16	-0.1353	0.0342	0.0001	-0.2023	-0.0683
Period 39: 2012/12/17-2013/01/13	-0.1326	0.0343	0.0001	-0.1998	-0.0654
Period 40: 2013/01/14-2013/02/10	-0.0832	0.0338	0.0140	-0.1495	-0.0168
Period 41: 2013/02/11-2013/03/10	-0.0745	0.0338	0.0278	-0.1408	-0.0081
Period 42: 2013/03/11-2013/04/07	-0.1487	0.0344	0.0000	-0.2162	-0.0812
Period 43: 2013/04/08-2013/05/05	-0.1702	0.0343	0.0000	-0.2375	-0.1029
Period 44: 2013/05/06-2013/06/02	-0.1308	0.0338	0.0001	-0.1970	-0.0645
Period 45: 2013/06/03-2013/06/30	-0.1517	0.0338	0.0000	-0.2181	-0.0854
Period 46: 2013/07/01-2013/07/28	-0.1374	0.0336	0.0000	-0.2033	-0.0715
Period 47: 2013/07/29-2013/08/25	-0.1293	0.0335	0.0001	-0.1951	-0.0636
Period 48: 2013/08/26-2013/09/22	-0.1728	0.0338	0.0000	-0.2391	-0.1065
Period 49: 2013/09/23-2013/10/20	-0.2286	0.0343	0.0000	-0.2958	-0.1615
Period 50: 2013/10/21-2013/11/17	-0.2107	0.0341	0.0000	-0.2775	-0.1440
Period 51: 2013/11/18-2013/12/15	-0.2098	0.0341	0.0000	-0.2765	-0.1430
Period 52: 2013/12/16-2014/01/12	-0.1822	0.0340	0.0000	-0.2488	-0.1156
Period 53: 2014/01/13-2014/02/09	-0.1396	0.0336	0.0000	-0.2054	-0.0737
Period 54: 2014/02/10-2014/03/09	-0.1908	0.0340	0.0000	-0.2575	-0.1241
Period 55: 2014/03/10-2014/04/06	-0.1932	0.0341	0.0000	-0.2599	-0.1265
Period 56: 2014/04/07-2014/05/04	-0.2214	0.0342	0.0000	-0.2884	-0.1544
Period 57: 2014/05/05-2014/06/01	-0.1906	0.0339	0.0000	-0.2571	-0.1242
Period 58: 2014/06/02-2014/06/29	-0.1953	0.0339	0.0000	-0.2618	-0.1289
Period 59: 2014/06/30-2014/07/27	-0.1678	0.0337	0.0000	-0.2339	-0.1017
Period 60: 2014/07/28-2014/08/24	-0.1699	0.0337	0.0000	-0.2360	-0.1038
Period 61: 2014/08/25-2014/09/21	-0.1712	0.0337	0.0000	-0.2373	-0.1051
Period 62: 2014/09/22-2014/10/19	-0.1738	0.0337	0.0000	-0.2399	-0.1077
Period 63: 2014/10/20-2014/11/16	-0.1868	0.0338	0.0000	-0.2531	-0.1205
Period 64: 2014/11/17-2014/12/14	-0.1865	0.0338	0.0000	-0.2528	-0.1202
Period 65: 2014/12/15-2015/01/11	-0.2237	0.0343	0.0000	-0.2909	-0.1565
Period 66: 2015/01/12-2015/02/08	-0.1736	0.0338	0.0000	-0.2399	-0.1073
Period 67: 2015/02/09-2015/03/08	-0.1813	0.0339	0.0000	-0.2478	-0.1149
Period 68: 2015/03/09-2015/04/05	-0.1598	0.0338	0.0000	-0.2259	-0.0936
Period 69: 2015/04/06-2015/05/03	-0.1622	0.0337	0.0000	-0.2283	-0.0962
Period 70: 2015/05/04-2015/05/31	-0.1874	0.0338	0.0000	-0.2537	-0.1211
Period 71: 2015/06/01-2015/06/28	-0.1762	0.0337	0.0000	-0.2423	-0.1100
Period 72: 2015/06/29-2015/07/26	-0.2223	0.0341	0.0000	-0.2892	-0.1554
Period 73: 2015/07/27-2015/08/23	-0.1962	0.0339	0.0000	-0.2627	-0.1297

**Age**

65-74 (reference group)	(omitted)				
75-84	0.0289	0.0094	0.0020	0.0106	0.0473
<65	1.0427	0.0067	0.0000	1.0295	1.0559
>=85	0.0962	0.0146	0.0000	0.0676	0.1249

**Race**

Black (reference group)	(omitted)				
Hispanic	-0.0836	0.0143	0.0000	-0.1117	-0.0556
Other	-0.2881	0.0148	0.0000	-0.3172	-0.2590
White	-0.2529	0.0070	0.0000	-0.2667	-0.2392
<b>Gender</b>					
Female (reference group)	(omitted)				
Male	0.1500	0.0056	0.0000	0.1390	0.1610
Constant	-5.7364	0.0258	0.0000	-5.7870	-5.6858

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Table F-3. Logit Model – Diabetes-Related Emergency Room (ER) Visit

Outcome	95% CI					
	Diabetes-Related ER	Coefficient	Standard Error	P-value	Lower Bound	Upper Bound
<b>Period</b>						
Period 1: 2010/01/18-2010/02/14 (reference group)	(omitted)					
Period 2: 2010/02/15-2010/03/14	0.0025	0.0258	0.9237	-0.0481	0.0530	
Period 3: 2010/03/15-2010/04/11	0.0069	0.0257	0.7894	-0.0435	0.0573	
Period 4: 2010/04/12-2010/05/09	0.0331	0.0254	0.1930	-0.0168	0.0830	
Period 5: 2010/05/10-2010/06/06	0.0404	0.0253	0.1109	-0.0093	0.0900	
Period 6: 2010/06/07-2010/07/04	0.0410	0.0253	0.1051	-0.0086	0.0906	
Period 7: 2010/07/05-2010/08/01	0.0271	0.0254	0.2846	-0.0226	0.0768	
Period 8: 2010/08/02-2010/08/29	-0.0049	0.0255	0.8489	-0.0549	0.0451	
Period 9: 2010/08/30-2010/09/26	-0.0011	0.0255	0.9650	-0.0511	0.0488	
Period 10: 2010/09/27-2010/10/24	-0.0048	0.0255	0.8511	-0.0547	0.0452	
Period 11: 2010/10/25-2010/11/21	-0.0208	0.0256	0.4159	-0.0709	0.0293	
Period 12: 2010/11/22-2010/12/19	-0.0293	0.0256	0.2515	-0.0795	0.0208	
Period 13: 2010/12/20-2011/01/16	-0.0282	0.0256	0.2716	-0.0784	0.0220	
Period 14: 2011/01/17-2011/02/13	-0.0310	0.0256	0.2257	-0.0811	0.0191	
Period 15: 2011/02/14-2011/03/13	0.0092	0.0253	0.7162	-0.0404	0.0588	
Period 16: 2011/03/14-2011/04/10	-0.0221	0.0255	0.3862	-0.0720	0.0279	
Period 17: 2011/04/11-2011/05/08	0.0219	0.0251	0.3830	-0.0273	0.0711	
Period 18: 2011/05/09-2011/06/05	-0.0052	0.0252	0.8356	-0.0546	0.0442	
Period 19: 2011/06/06-2011/07/03	0.0085	0.0251	0.7357	-0.0407	0.0576	
Period 20: 2011/07/04-2011/07/31	0.0020	0.0251	0.9372	-0.0471	0.0511	
Period 21: 2011/08/01-2011/08/28	-0.0234	0.0252	0.3522	-0.0728	0.0259	
Period 22: 2011/08/29-2011/09/25	-0.0481	0.0253	0.0575	-0.0977	0.0015	
Period 23: 2011/09/26-2011/10/23	-0.0769	0.0255	0.0025	-0.1268	-0.0270	
Period 24: 2011/10/24-2011/11/20	-0.0410	0.0252	0.1042	-0.0904	0.0084	
Period 25: 2011/11/21-2011/12/18	-0.0508	0.0252	0.0442	-0.1002	-0.0013	
Period 26: 2011/12/19-2012/01/15	-0.0241	0.0251	0.3384	-0.0733	0.0252	
Period 27: 2012/01/16-2012/02/12	-0.0098	0.0250	0.6940	-0.0589	0.0392	
Period 28: 2012/02/13-2012/03/11	-0.0289	0.0252	0.2503	-0.0783	0.0204	
Period 29: 2012/03/12-2012/04/08	-0.0376	0.0252	0.1355	-0.0871	0.0118	
Period 30: 2012/04/09-2012/05/06	-0.0393	0.0251	0.1179	-0.0886	0.0100	
Period 31: 2012/05/07-2012/06/03	-0.0503	0.0251	0.0452	-0.0996	-0.0011	
Period 32: 2012/06/04-2012/07/01	-0.0423	0.0250	0.0913	-0.0913	0.0068	
Period 33: 2012/07/02-2012/07/29	-0.0506	0.0250	0.0433	-0.0996	-0.0015	
Period 34: 2012/07/30-2012/08/26	-0.0277	0.0249	0.2651	-0.0765	0.0210	
Period 35: 2012/08/27-2012/09/23	-0.0562	0.0250	0.0246	-0.1052	-0.0072	
Period 36: 2012/09/24-2012/10/21	-0.0560	0.0250	0.0250	-0.1049	-0.0070	
Period 37: 2012/10/22-2012/11/18	-0.0781	0.0251	0.0018	-0.1273	-0.0290	



Period 38: 2012/11/19-2012/12/16	-0.0592	0.0249	0.0176	-0.1081	-0.0103
Period 39: 2012/12/17-2013/01/13	-0.0673	0.0251	0.0073	-0.1164	-0.0181
Period 40: 2013/01/14-2013/02/10	-0.0644	0.0250	0.0101	-0.1135	-0.0154
Period 41: 2013/02/11-2013/03/10	-0.0756	0.0251	0.0026	-0.1249	-0.0263
Period 42: 2013/03/11-2013/04/07	-0.0609	0.0251	0.0151	-0.1100	-0.0118
Period 43: 2013/04/08-2013/05/05	-0.0732	0.0249	0.0033	-0.1221	-0.0243
Period 44: 2013/05/06-2013/06/02	-0.0691	0.0248	0.0053	-0.1176	-0.0206
Period 45: 2013/06/03-2013/06/30	-0.0754	0.0247	0.0023	-0.1238	-0.0270
Period 46: 2013/07/01-2013/07/28	-0.0788	0.0247	0.0014	-0.1271	-0.0305
Period 47: 2013/07/29-2013/08/25	-0.0829	0.0247	0.0008	-0.1312	-0.0346
Period 48: 2013/08/26-2013/09/22	-0.1030	0.0247	0.0000	-0.1515	-0.0545
Period 49: 2013/09/23-2013/10/20	-0.1318	0.0249	0.0000	-0.1806	-0.0830
Period 50: 2013/10/21-2013/11/17	-0.1447	0.0249	0.0000	-0.1935	-0.0958
Period 51: 2013/11/18-2013/12/15	-0.1411	0.0249	0.0000	-0.1899	-0.0923
Period 52: 2013/12/16-2014/01/12	-0.1128	0.0248	0.0000	-0.1615	-0.0642
Period 53: 2014/01/13-2014/02/09	-0.1216	0.0249	0.0000	-0.1704	-0.0729
Period 54: 2014/02/10-2014/03/09	-0.1212	0.0249	0.0000	-0.1700	-0.0725
Period 55: 2014/03/10-2014/04/06	-0.1157	0.0248	0.0000	-0.1644	-0.0671
Period 56: 2014/04/07-2014/05/04	-0.1283	0.0248	0.0000	-0.1770	-0.0796
Period 57: 2014/05/05-2014/06/01	-0.0906	0.0246	0.0002	-0.1388	-0.0423
Period 58: 2014/06/02-2014/06/29	-0.0915	0.0246	0.0002	-0.1397	-0.0433
Period 59: 2014/06/30-2014/07/27	-0.0853	0.0246	0.0005	-0.1335	-0.0371
Period 60: 2014/07/28-2014/08/24	-0.0773	0.0245	0.0016	-0.1254	-0.0292
Period 61: 2014/08/25-2014/09/21	-0.1000	0.0247	0.0001	-0.1483	-0.0516
Period 62: 2014/09/22-2014/10/19	-0.1094	0.0247	0.0000	-0.1578	-0.0609
Period 63: 2014/10/20-2014/11/16	-0.1263	0.0248	0.0000	-0.1749	-0.0777
Period 64: 2014/11/17-2014/12/14	-0.1302	0.0248	0.0000	-0.1789	-0.0816
Period 65: 2014/12/15-2015/01/11	-0.1147	0.0248	0.0000	-0.1634	-0.0660
Period 66: 2015/01/12-2015/02/08	-0.0924	0.0247	0.0002	-0.1407	-0.0440
Period 67: 2015/02/09-2015/03/08	-0.1537	0.0250	0.0000	-0.2028	-0.1047
Period 68: 2015/03/09-2015/04/05	-0.0895	0.0247	0.0003	-0.1379	-0.0412
Period 69: 2015/04/06-2015/05/03	-0.0758	0.0245	0.0020	-0.1239	-0.0277
Period 70: 2015/05/04-2015/05/31	-0.0580	0.0244	0.0175	-0.1058	-0.0101
Period 71: 2015/06/01-2015/06/28	-0.0651	0.0245	0.0078	-0.1130	-0.0172
Period 72: 2015/06/29-2015/07/26	-0.0858	0.0246	0.0005	-0.1340	-0.0376
Period 73: 2015/07/27-2015/08/23	-0.0716	0.0245	0.0035	-0.1196	-0.0235

**Age**

65-74 (reference group)	(omitted)				
75-84	0.1306	0.0065	0.0000	0.1179	0.1433
<65	0.9606	0.0049	0.0000	0.9510	0.9701
>=85	0.2171	0.0098	0.0000	0.1978	0.2364

**Race**

Black (reference group)	(omitted)				
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Hispanic	-0.1969	0.0105	0.0000	-0.2176	-0.1763
Other	-0.4563	0.0111	0.0000	-0.4781	-0.4345
White	-0.3466	0.0050	0.0000	-0.3564	-0.3369
<b>Gender</b>					
Female (reference group)	(omitted)				
Male	-0.0031	0.0041	0.4547	-0.0111	0.0050
Constant	-4.9619	0.0190	0.0000	-4.9992	-4.9246

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