

INTRODUCTION

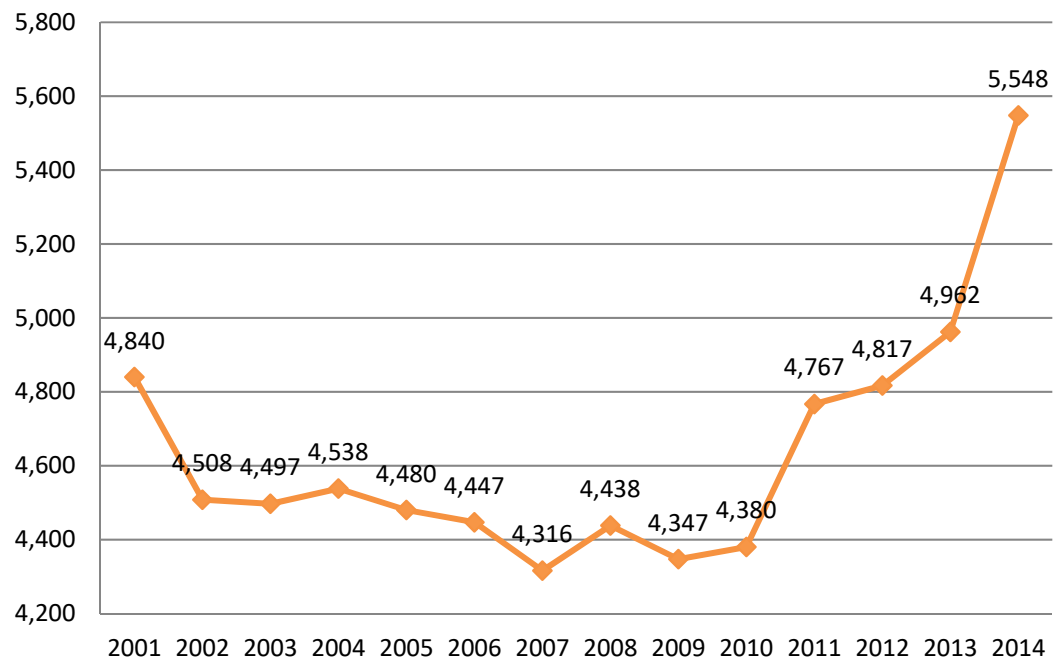
Currently, 1.9 million people are living with limb loss in the United States, and an average of 507 people continue to lose a limb every day. This results in an estimated 185,000 amputations per year (1), and this number is expected to double by the year 2050 due to increasing rates of diabetes and vascular disease (1). Among those living with limb loss, the major causes of their amputations are vascular disease (54%) – including diabetes and peripheral arterial disease – trauma (45%) and cancer (less than 2%) (2). The most common causes of pediatric amputations, however, are lawn mower accidents (3). Non-whites comprise about 42% of the limb loss population in the U.S. (1). In 2008, the diabetes related amputation rate among African Americans was nearly four times that of whites (4).

A total of 5,548 amputations were performed in Michigan hospitals in 2014. These amputations were performed for a variety of reasons, including diabetes and peripheral arterial disease complications. The following information details the trends and most current rates of amputation and diabetes in Michigan.

1. AMPUTATION TRENDS OVER TIME

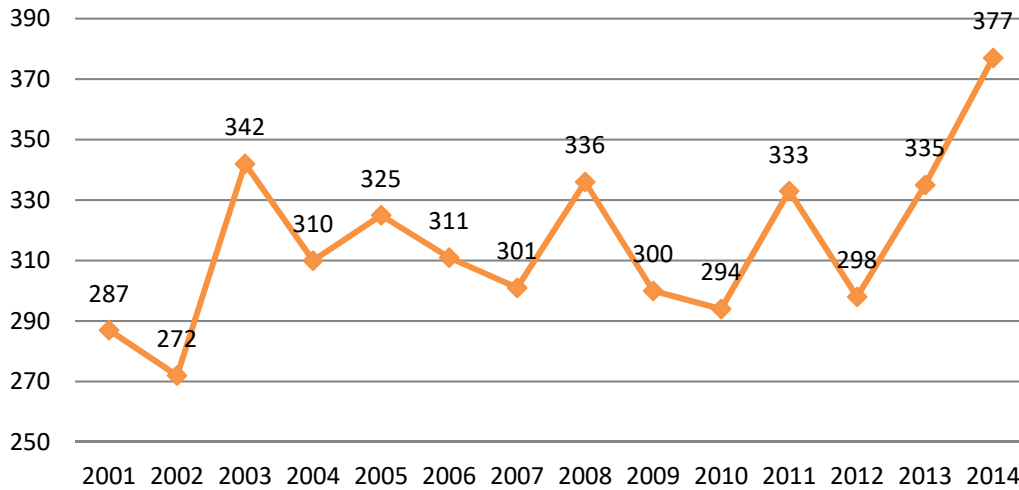
**1.1: Amputation Trends,
Michigan (2001-2014)**

The number of total amputations performed in Michigan increased 14.6% from 2001 to 2014 according to hospital discharge data. A total of 64,885 procedures were performed in this time period. After dropping from 4,840 to 4,316 between the years of 2001 and 2007, the number of amputation gradually rose again to 5,548 in 2014. (See Graph 1.1)



Source: Healthcare Cost and Utilization Project HCUPnet database <http://hcupnet.ahrq.gov/>

1.2: Upper-Extremity Amputation Trends, Michigan (2001-2014)

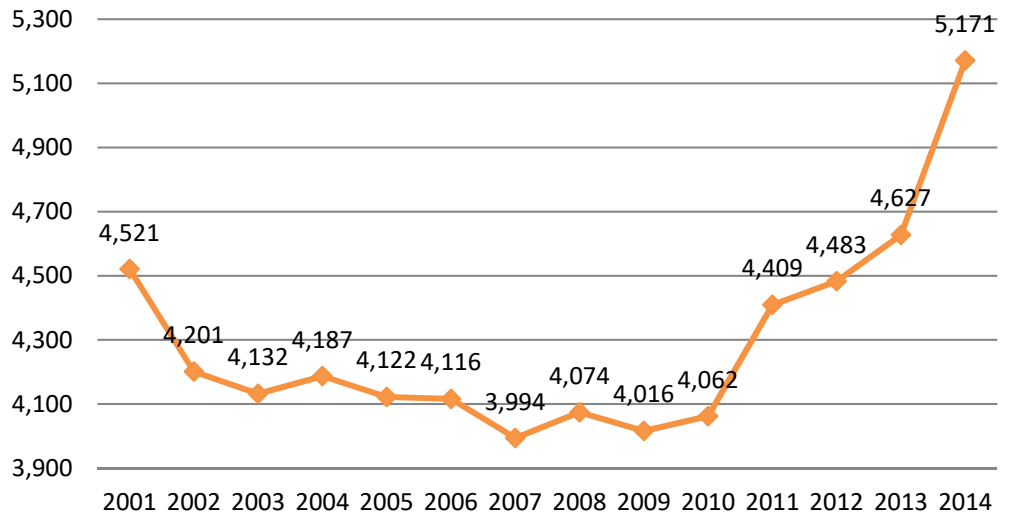


The number of upper-extremity amputations performed each year ultimately increased 31.36% from 2001 to 2014. A total of 4,421 of these procedures were performed in this time period. The lowest incidence of these amputations (272) occurred in 2002, while 2014 saw the most upper-extremity amputations (377) in this time period. (Graph 1.2)

Source: Healthcare Cost and Utilization Project HCUPnet database <http://hcupnet.ahrq.gov/>

1.3: Lower-Extremity Amputation Trends, Michigan (2001-2014)

From 2001 to 2014, a total of 60,115 lower-extremity amputations were performed in Michigan. A decline in lower-extremity amputations occurred from 2001 to 2007, where the numbers reached their lowest at 3,994. The number of amputations then climbed until they reached 5,171 in 2014. This is a 14.4% increase from the number of lower-extremity amputations performed in 2001 to 2014. (See Graph 1.3)

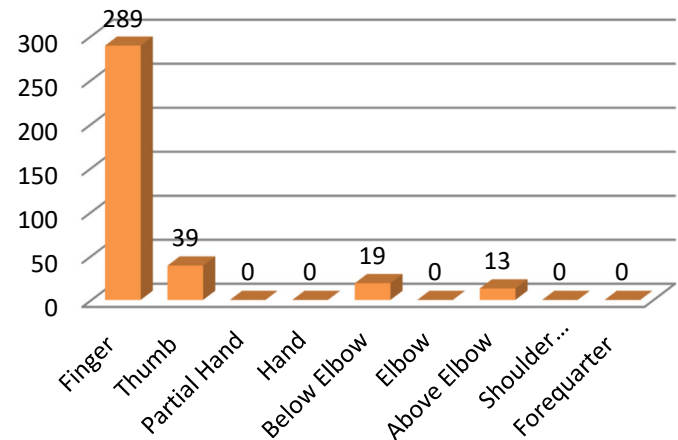


Source: Healthcare Cost and Utilization Project HCUPnet database <http://hcupnet.ahrq.gov/>

2. TYPES OF AMPUTATIONS PERFORMED

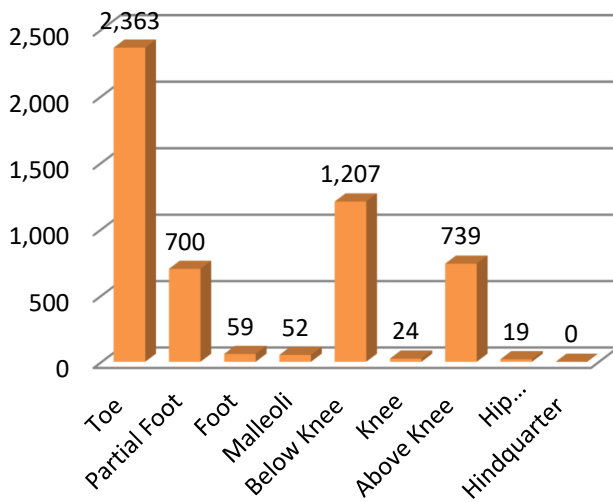
360 upper-extremity amputations were performed in 2014. The most common minor upper-extremity amputations were of the fingers (289) and the most common major upper-extremity procedures were above the elbow (19). (See Graph 2.1)

2.1: Upper-Extremity Amputations, Michigan (2014)



Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

2.2: Lower-Extremity Amputations, Michigan (2014)



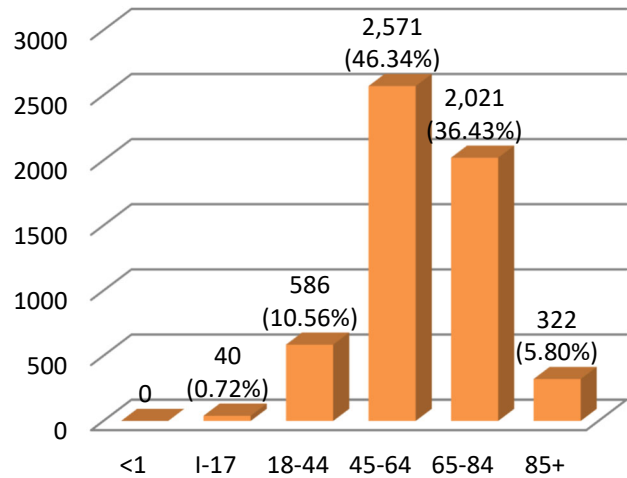
Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

5,163 lower-extremity amputations were performed in 2014. In terms of minor lower-extremity amputations, toes (2,363) were amputated more often than part of the foot (700). For major lower-extremity amputations, below-knee (1,207) amputation was the most common procedure. (See Graph 2.2)

3. WHO LOSES A LIMB?

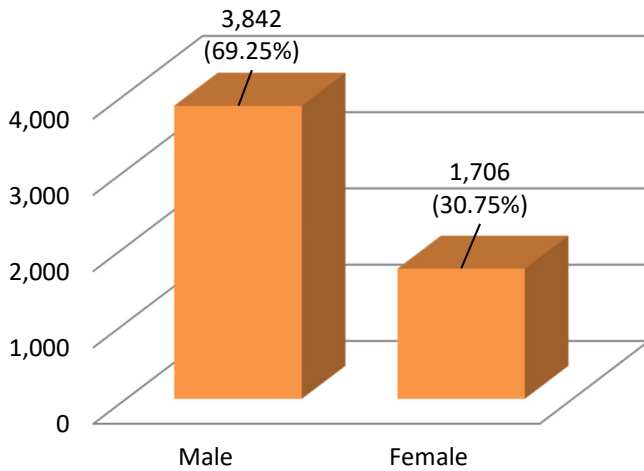
In 2014, most amputations were performed on individuals aged 45-64 years old, followed by the age group of 65-84 year olds (See Graph 3.1).

3.1: Amputations by Age Group, Michigan (2014)



Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

3.2: Amputations by Sex, Michigan (2014)

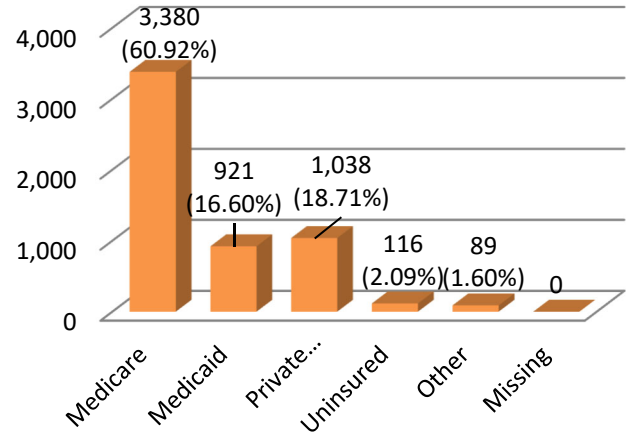


There were nearly 2.5 times more amputations performed on male patients in Michigan than on female patients (See Graph 3.2).

Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

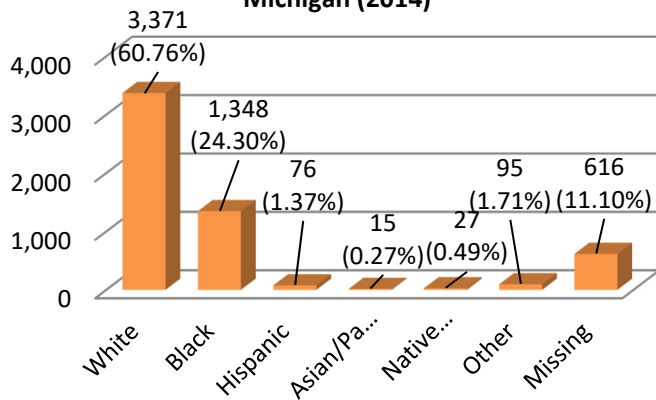
Medicare recipients (60.92%) ranked as the most common group to have an amputation procedure, followed by private insurance (18.71%). (See Graph 3.3)

3.3: Amputations by Payer Type, Michigan (2014)



Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

3.4: Amputations by Race/Ethnicity, Michigan (2014)



Source: Healthcare Cost and Utilization Project HCUPnet database
<http://hcupnet.ahrq.gov/>

We can see that the African American population of Michigan bears the heaviest burden of amputation (0.097% of the African American population underwent amputations). This is evident when compared with the percentage of the white population that underwent amputations (0.043%), and with amputations in the state's population as a whole (0.056%). (See Graph 3.4)

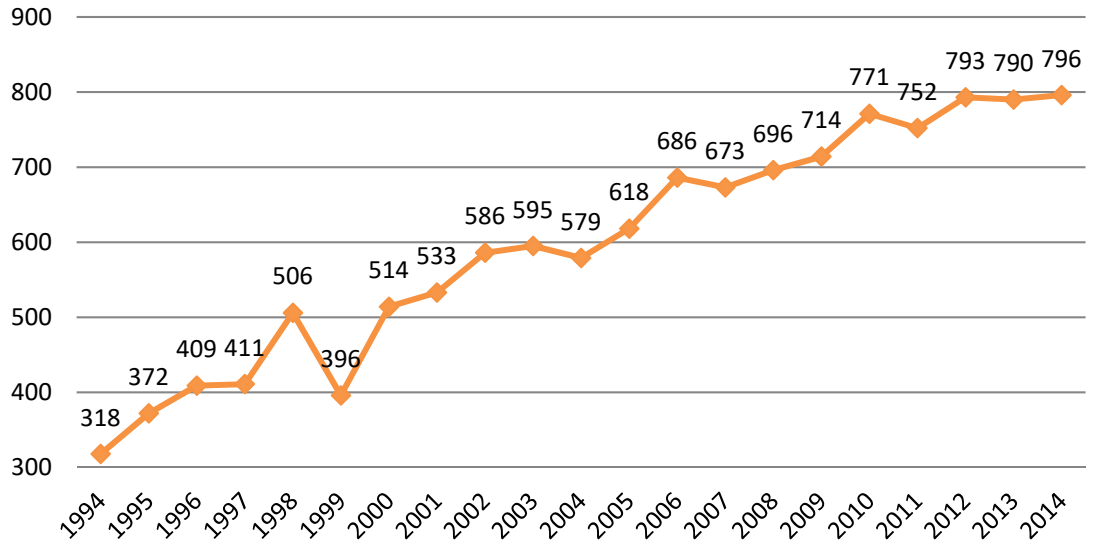
* According to Census Bureau estimation data (http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?sr_c=CF) the population of Michigan in 2014 was about 9,889,024 and was made up of about 7,829,621 white residents and 1,383,205 African American residents.

4. DIABETES TRENDS

4.1: Diabetes Trends (in thousands; 18+), Michigan (1994-2014)

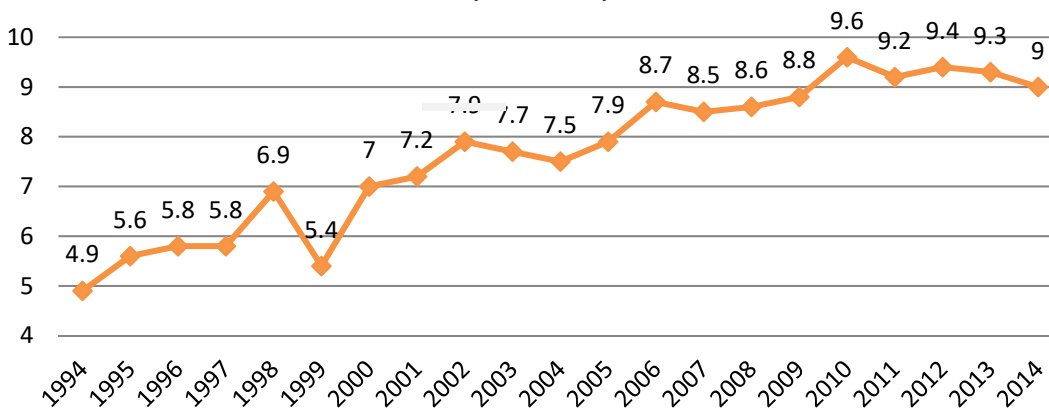
Diabetes is a leading cause of lower-extremity amputations.

In 2014, a total of 796,253 Michigan residents indicated that they had been diagnosed with diabetes at some point in their lives. The prevalence of diabetes in the adult population of Michigan increased 150.3% from 1994 to 2014. (See Graph 4.1)



Source: CDC Behavioral Risk Factor Surveillance System <https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>

4.2: Yearly Rate of Existing Diabetes Cases per 100 Adults (18+), Michigan (1994-2014)



The annual rate of existing cases of diabetes among adults in Michigan increased 83.7% from 1994 to 2014. (See Graph 4.2)

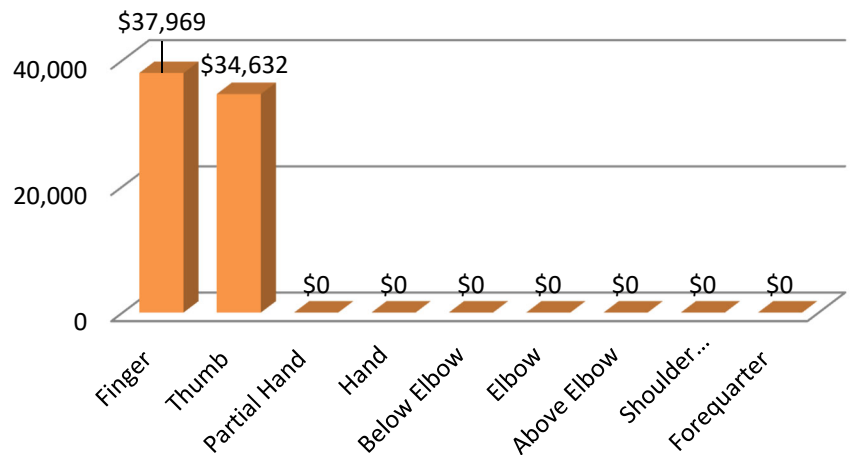
Source: CDC Behavioral Risk Factor Surveillance System <https://gis.cdc.gov/grasp/diabetes/DiabetesAtlas.html>

5. HEALTHCARE COSTS

For persons with a unilateral lower-extremity amputation, the two year healthcare costs, including initial hospitalization, inpatient rehabilitation, outpatient physical therapy, and purchase and maintenance of a prosthetic device, is estimated to be \$91,106. The lifetime healthcare cost for persons with a unilateral lower extremity amputation is estimated to be more than \$500,000 (5). It is anticipated that these healthcare costs would be higher for a person with a proximal amputation level and bilateral amputation status, due to higher prosthetic costs.

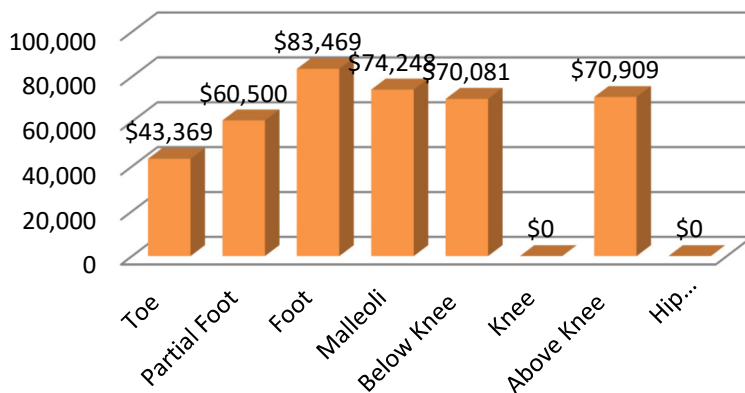
Charges represent what the hospital billed for the case, and may not represent all discharges for amputations. (See graph 5.1)

5.1: Overall Hospital Charges for Upper-Extremity Amputations, Michigan (2014)



Source: Healthcare Cost and Utilization Project HCUPnet database <http://hcupnet.ahrq.gov/>

5.2: Overall Hospital Charges for Lower-Extremity Amputations, Michigan (2014)



Charges represent what the hospital billed for the case, and may not represent all discharges for amputations. (See graph 5.2)

Source: Healthcare Cost and Utilization Project HCUPnet database <http://hcupnet.ahrq.gov/>

6. REFERENCES

1. Ziegler-Graham K, MacKenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the Prevalence of Limb Loss in the United States: 2005 to 2050. *Archives of Physical Medicine and Rehabilitation* 2008;89(3):422-9.
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3. Bryant PR, Pandian G. Acquired limb deficiencies. 1. Acquired limb deficiencies in children and young adults. *Archives of Physical Medicine and Rehabilitation* 2001;82(3B):00s3-s8.
4. Li Y, Burrows NR, Gregg EW, Albright A, Geiss LS. Declining Rates of Hospitalization for Nontraumatic Lower-Extremity Amputation in the Diabetic Population Aged 40 Years or Older: U.S., 1988-2008. *Diabetes Care* 2012;35(2):273-7.
5. MacKenzie EJ. Health-Care Costs Associated with Amputation or Reconstruction of a Limb-Threatening Injury. *The Journal of Bone and Joint Surgery (American)* 2007;89(8):1685.