- Our health is affected by our physical and social environments, our genes, our economic and educational opportunities, and to a much lesser degree, the medical care we receive. [1]

- [As] a society we are spending our health care dollars in the wrong ways for the wrong things – emphasizing treatment over prevention and medical care over social services. [2]

- 1 Schroeder. N Engl J Med 2007, 357, 1221-1228
- 2Bradley EH., Health Aff 2016;35:760-768

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Health starts where we live, learn, work and play.

WHAT MAKES US HEALTHY?

20% Clinical Care
20% Health Behaviors
5% Genes and Biology
55% Social and Economic Factors

Adapted from http://www.cdc.gov/socialdeterminants/FAQ.html
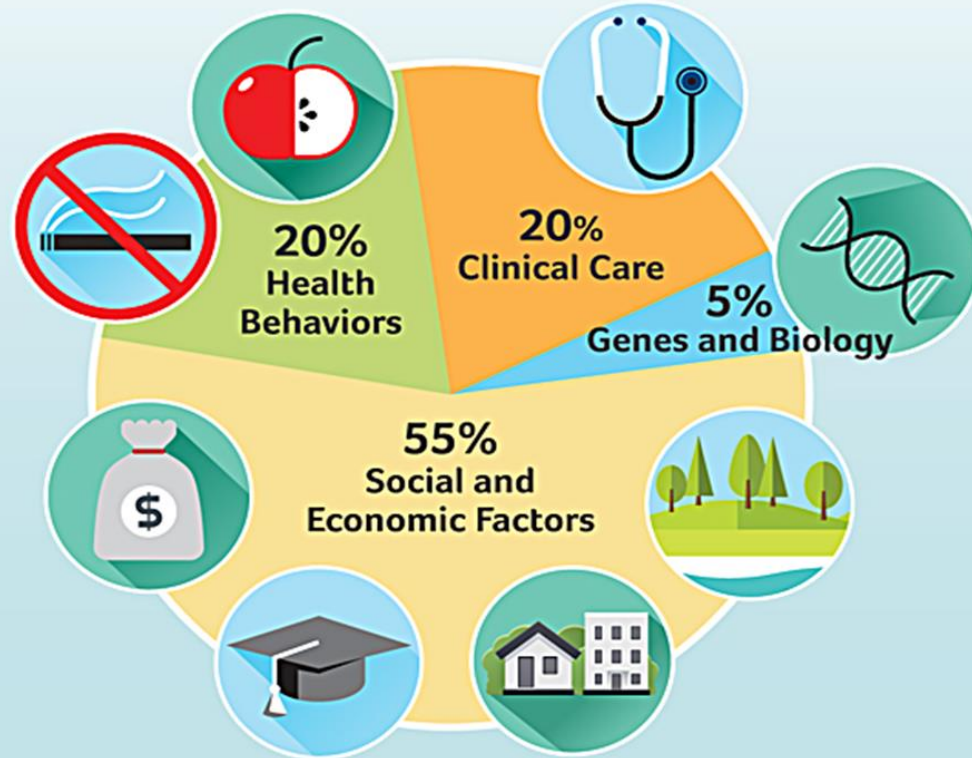
2014 Life-Expectancy at Birth by San Antonio City Council District
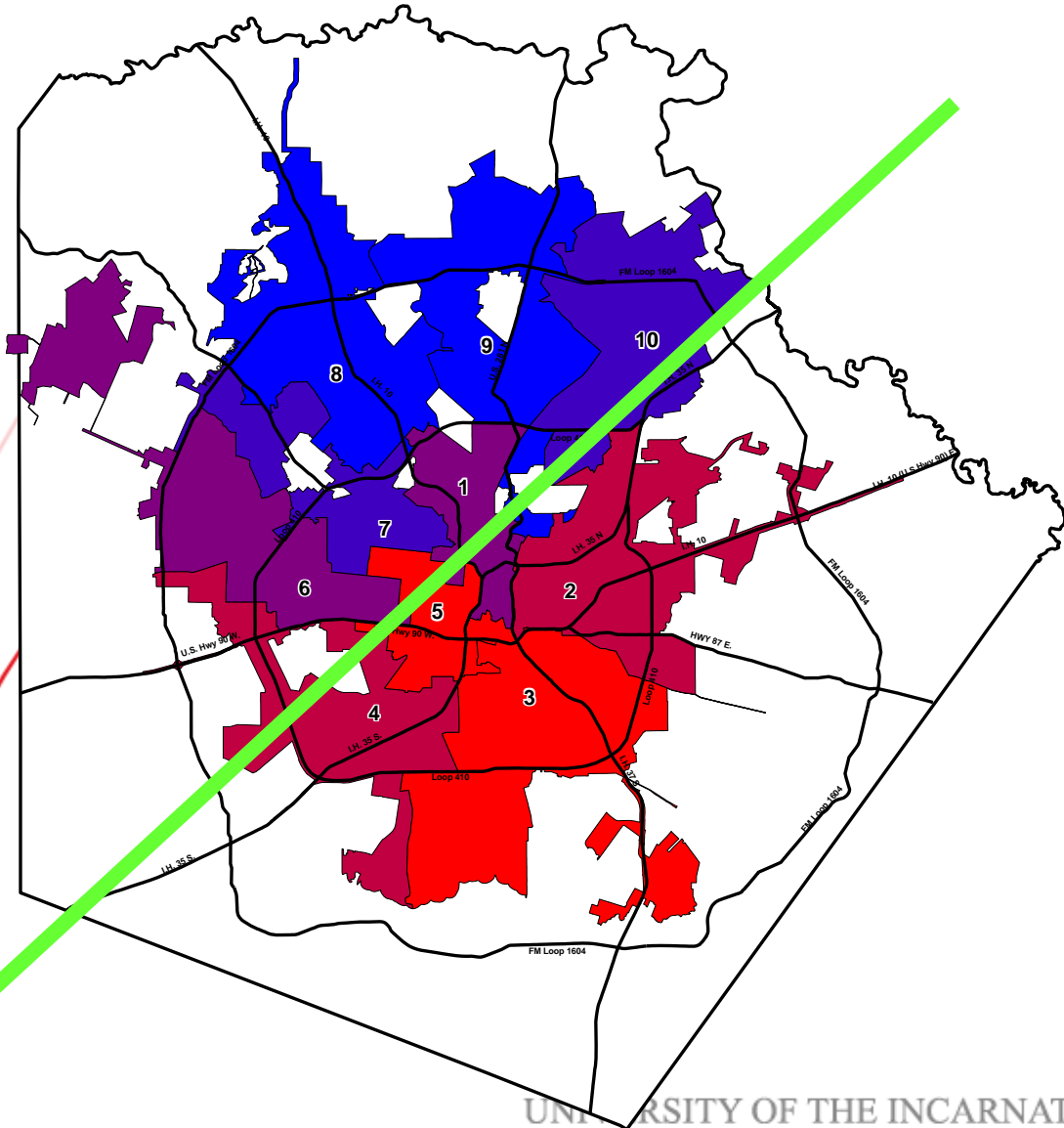
Legend:
- 81.43 to 81.74
- 79.42 to 81.42
- 77.88 to 79.41
- 75.74 to 77.87
- 75.68 to 75.73

Life expectancy at birth is the average number of years a newborn infant would be expected to live if healthy and living conditions at the time of birth remained the same throughout his/her life. Although life expectancy is a good starting point for discussing mortality patterns, it is important to note significant limitations of this measure.

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2010-2014 American Community Survey 5-Year Estimates

Objectives

1. Discuss the significance of an A1c
2. Identify the key chronic diseases associated with diabetes
3. Discuss the cost benefits of reducing diabetes
4. Discuss mental health and A1C
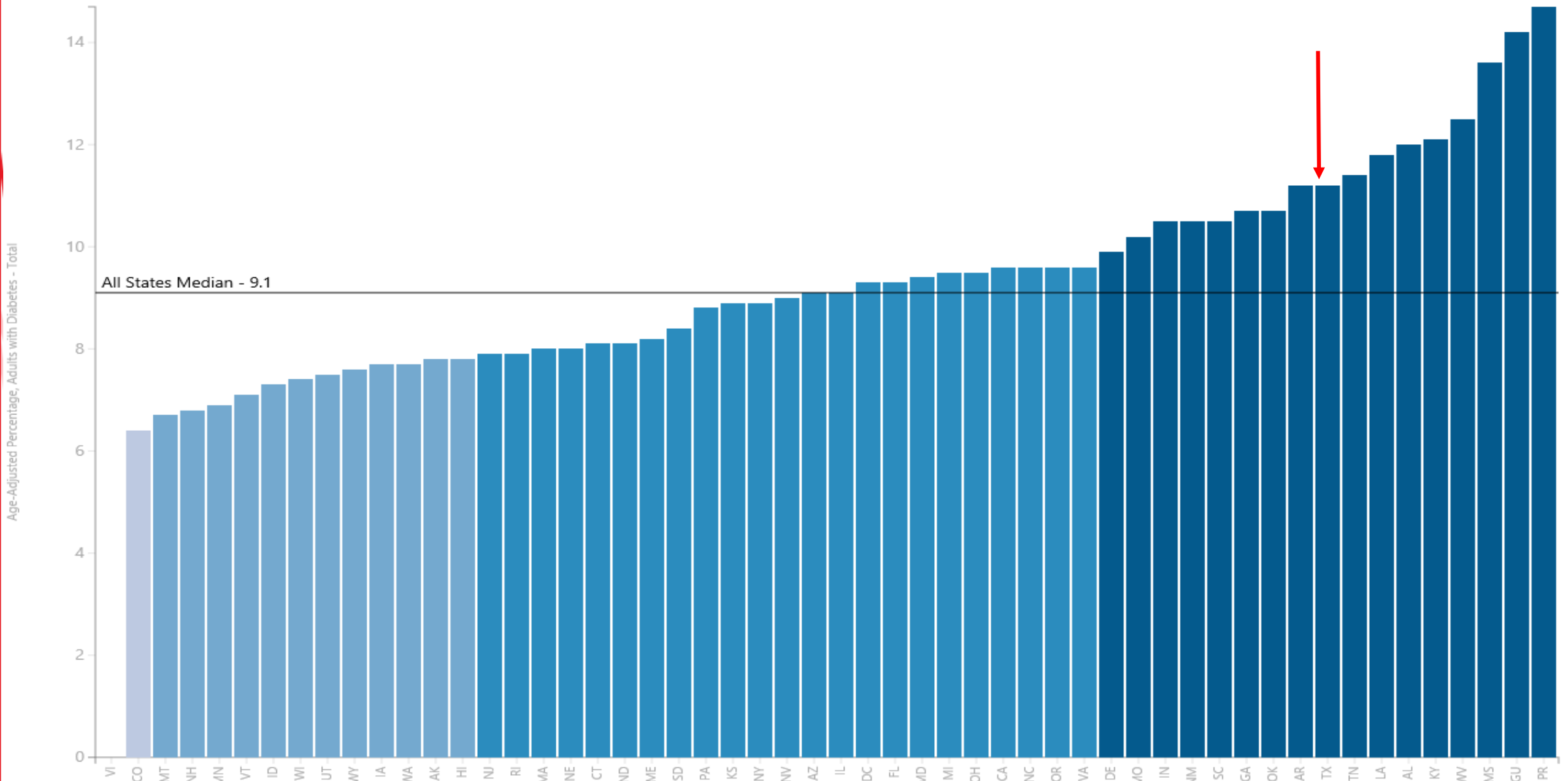5. Decreasing Amputations in District 3

Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2015

Adults diagnosed with Diabetes – US 2015

Adults diagnosed with Diabetes by age – US 2015
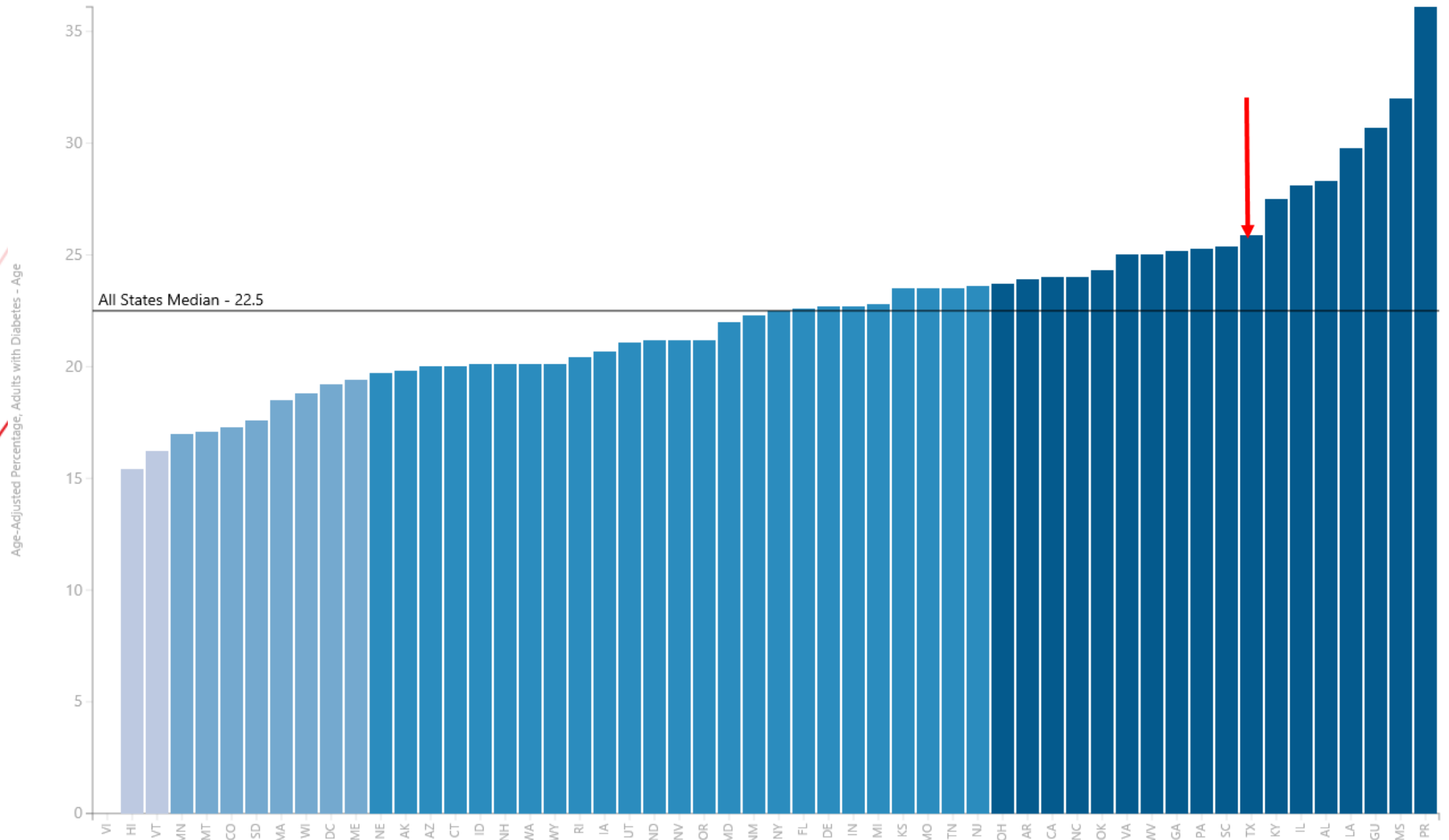
Adults diagnosed with Diabetes by Education in US
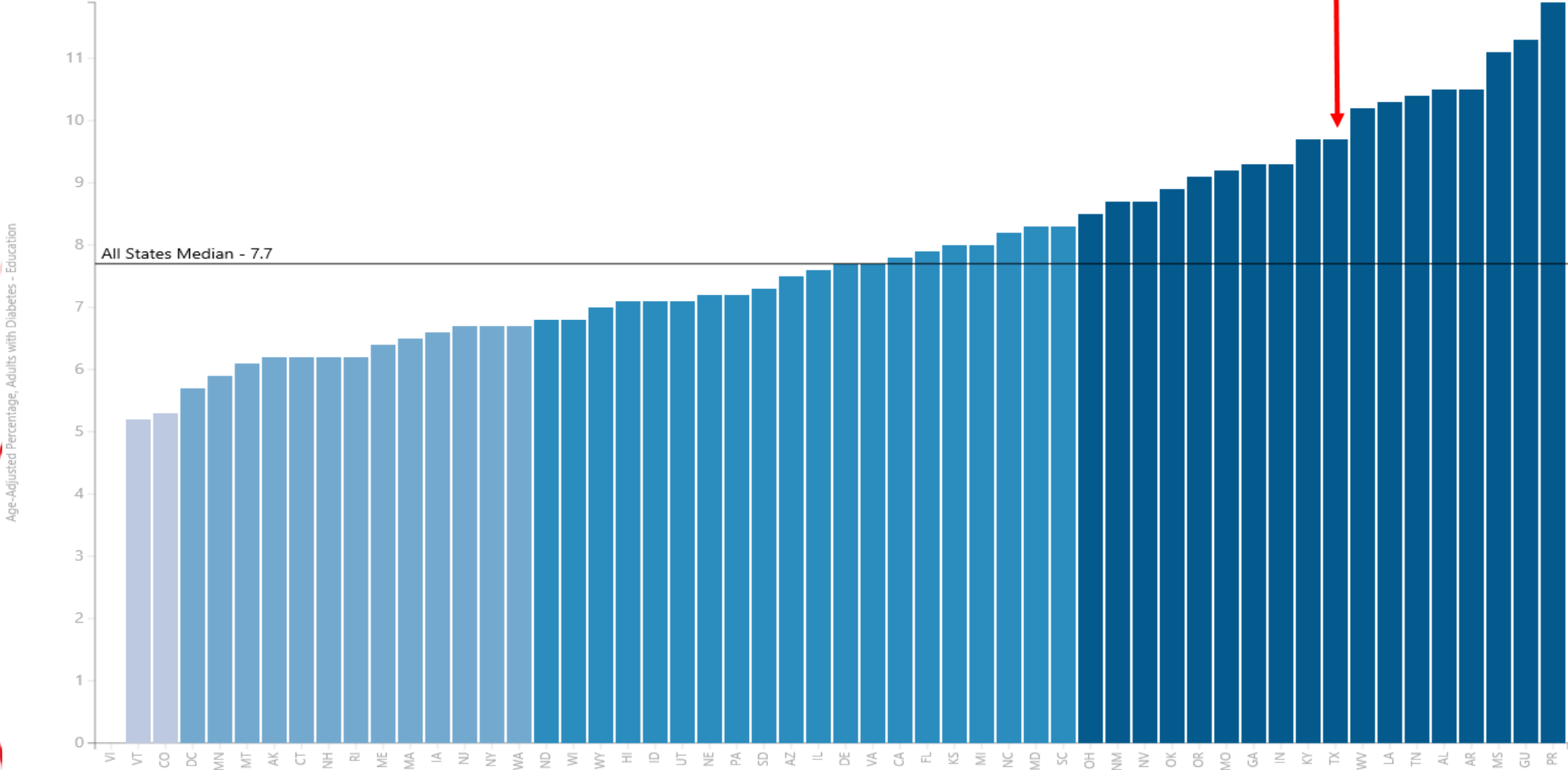
Age-adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

Obesity (BMI ≥30 kg/m²)

Legend (Obesity): No Data | <14.0% | 14.0%–17.9% | 18.0%–21.9% | 22.0%–25.9% | ≥ 26.0%

Diabetes

Legend (Diabetes): No Data | <4.5% | 4.5%–5.9% | 6.0%–7.4% | 7.5%–8.9% | ≥9.0%
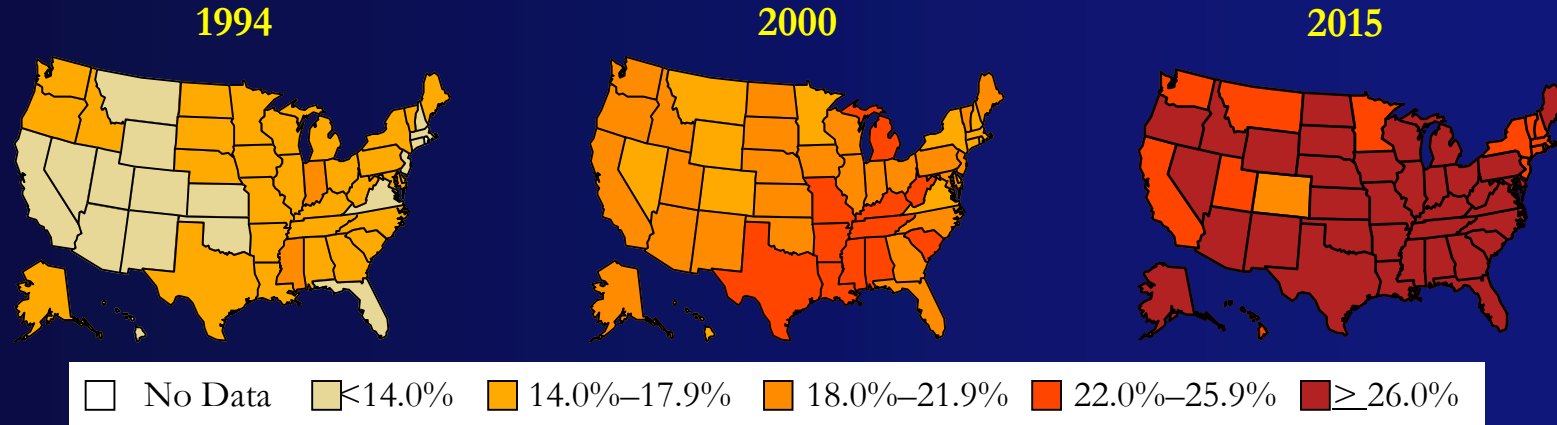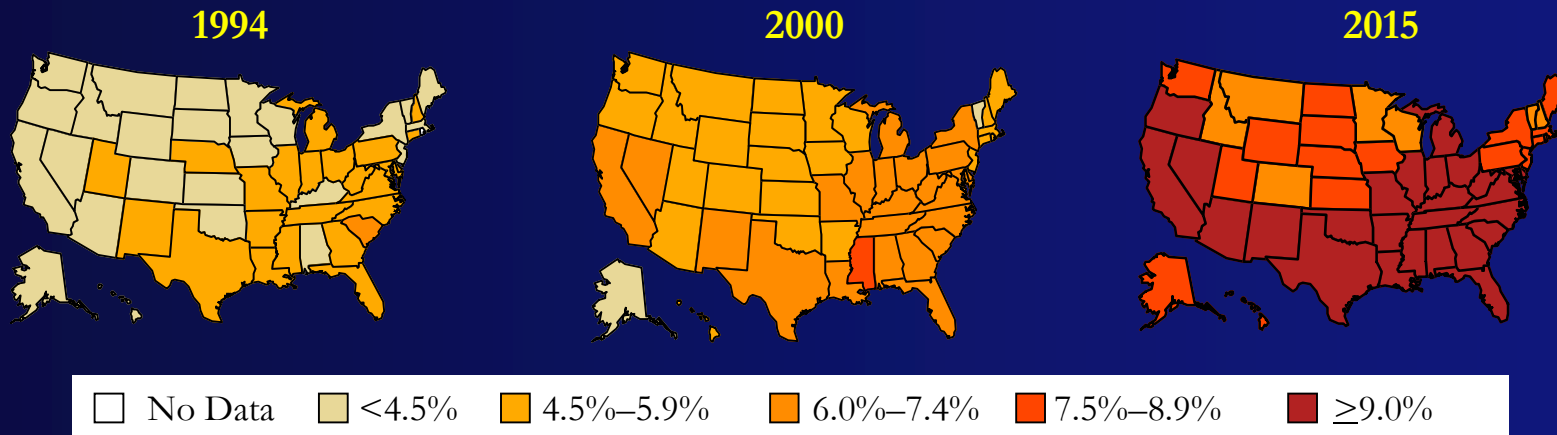
CDC's Division of Diabetes Translation. United States Surveillance System available at
http://www.cdc.gov/diabetes/data

What is A1C

A1C is a blood test for type 2 diabetes and prediabetes.

It measures your average blood glucose, or blood sugar, level over the past 3 months.

Doctors may use the A1C alone or in combination with other diabetes tests to make a diagnosis.

How the Test Works

Glucose
Hemoglobin
Red blood cell
Glycated hemoglobin
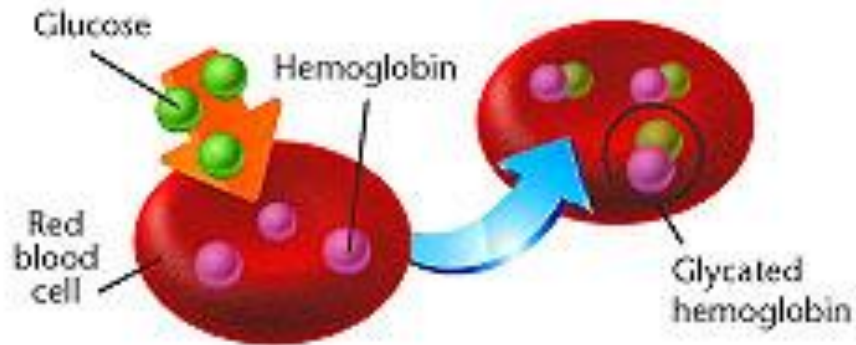
- The sugar in your blood is called glucose. When glucose builds up in your blood, it binds to the hemoglobin in your red blood cells. The A1c test measures how much glucose is bound.

- Red blood cells live for about 3 months, so the test shows the average level of glucose in your blood for the past 3 months.

A1c Test Results

Diabetes
6.5% or higher

Prediabetes
5.7 to 6.4%

Normal
Below 5.7%
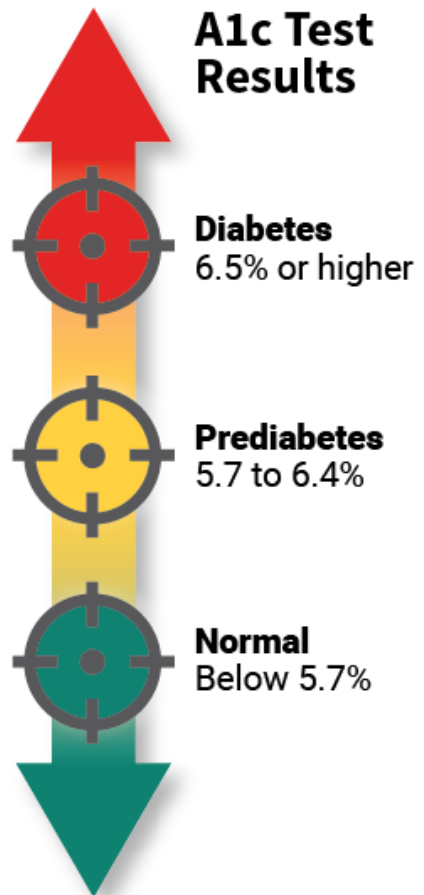
A1c and Blood Sugar

A1c and Blood Sugar

A1c (%)	Average Blood Sugar (mg/dL)
4	68
5	97
6	126
7	152
8	183
9	212
10	240
11	269
12	298
13	326
14	355

Setting Goals for A1c Levels

The target A1c level for people with diabetes is usually less than 7%. The higher the hemoglobin A1c, the higher your risk of having complications related to diabetes.

A combination of diet, exercise, and medication can bring your levels down.

People with diabetes should have an A1c test every 3 months to make sure their blood sugar is in their target range

Current & Projected Age Structure

Figure 2.6 Bexar County 2010 & 2050 population percentages by age and sex
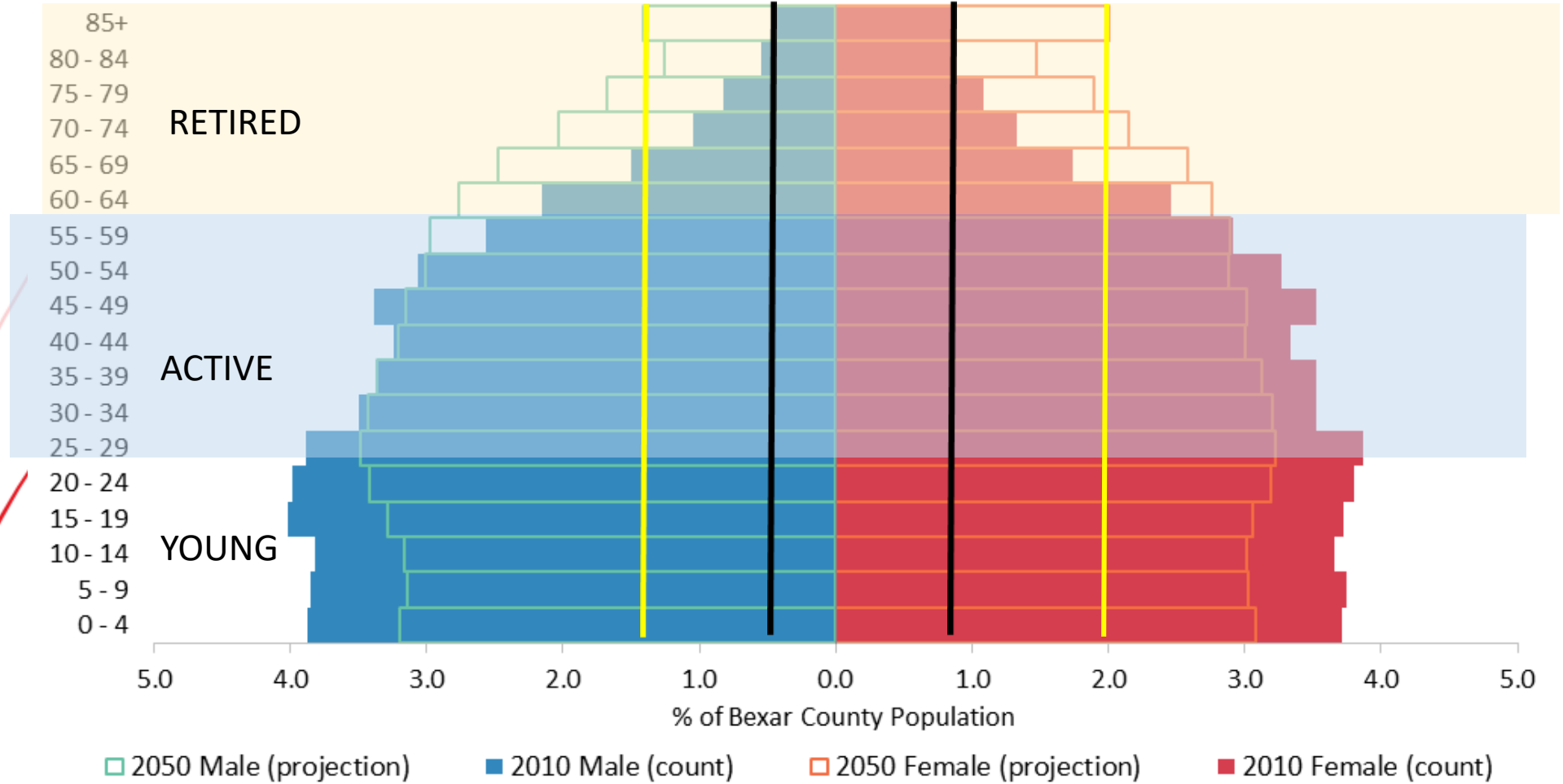
Source: U.S. Census Bureau; 2010 Census, QT-P1. Texas State Data Center; Projections of the Population for 2050, 2014.

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Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2012
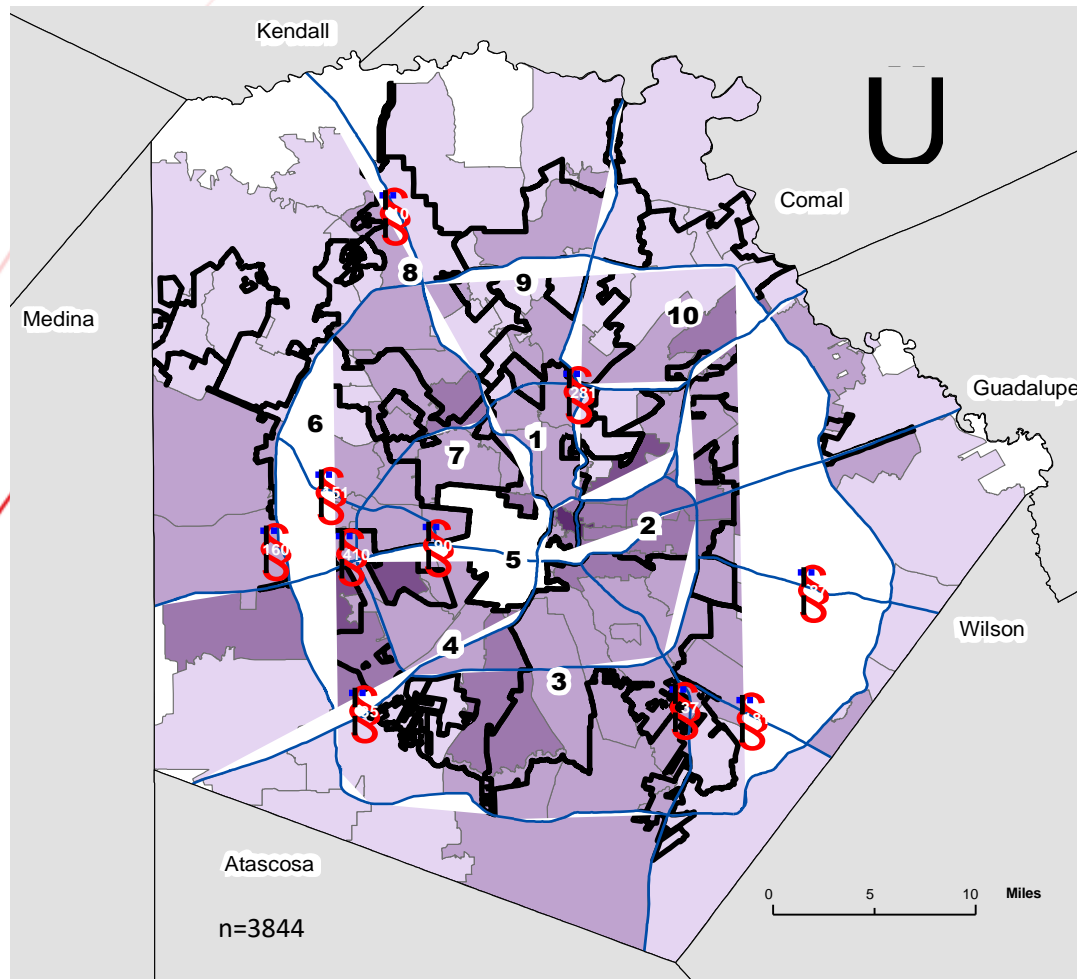
Legend

Diabetes rates/10,000 population by ZCTA

	Suppressed zip code data
	1.4 - 7.8
	7.9 - 14.5
	14.6 - 25.5
	25.6 - 36.8
	36.9 - 65.8
	Council Districts
	Military Bases & Inner Cities
	Major Highways
	Bexar County

n=3844

Note: This is all types of Diabetes

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Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2013

Legend

Diabetes rates/10,000 population by ZCTA

- Suppressed zip code data
- 1.4 - 9.7
- 9.8 - 21.3
- 21.4 - 34.4
- 34.5 - 66.9
- 67.0 - 136.6
- Council Districts
- Military Bases & Inner Cities
- Major Highways
- Bexar County

n=3669

Note: This is all types of Diabetes
Source: Case data source: 2013 Hospital Discharge Public Use Data Base 1 File.
Population data source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Accessed 8/13/2018.

Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2014
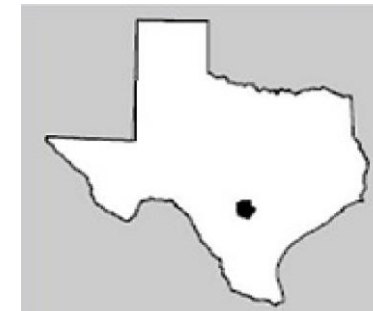

Legend

Diabetes rates/10,000 population by ZCTA

- Suppressed zip code data
- 1.3 - 9.9
- 10.0 - 20.7
- 20.8 - 32.0
- 32.1 - 46.6
- 46.7 - 154.9
- Council Districts
- Military Bases & Inner Cities
- Major Highways
- Bexar County

n=4018

Note: This is all types of Diabetes
Source: Case data source: 2014 Hospital Discharge Public Use Data Base 1 File.
Population data source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Accessed 8/13/2018.

Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2015
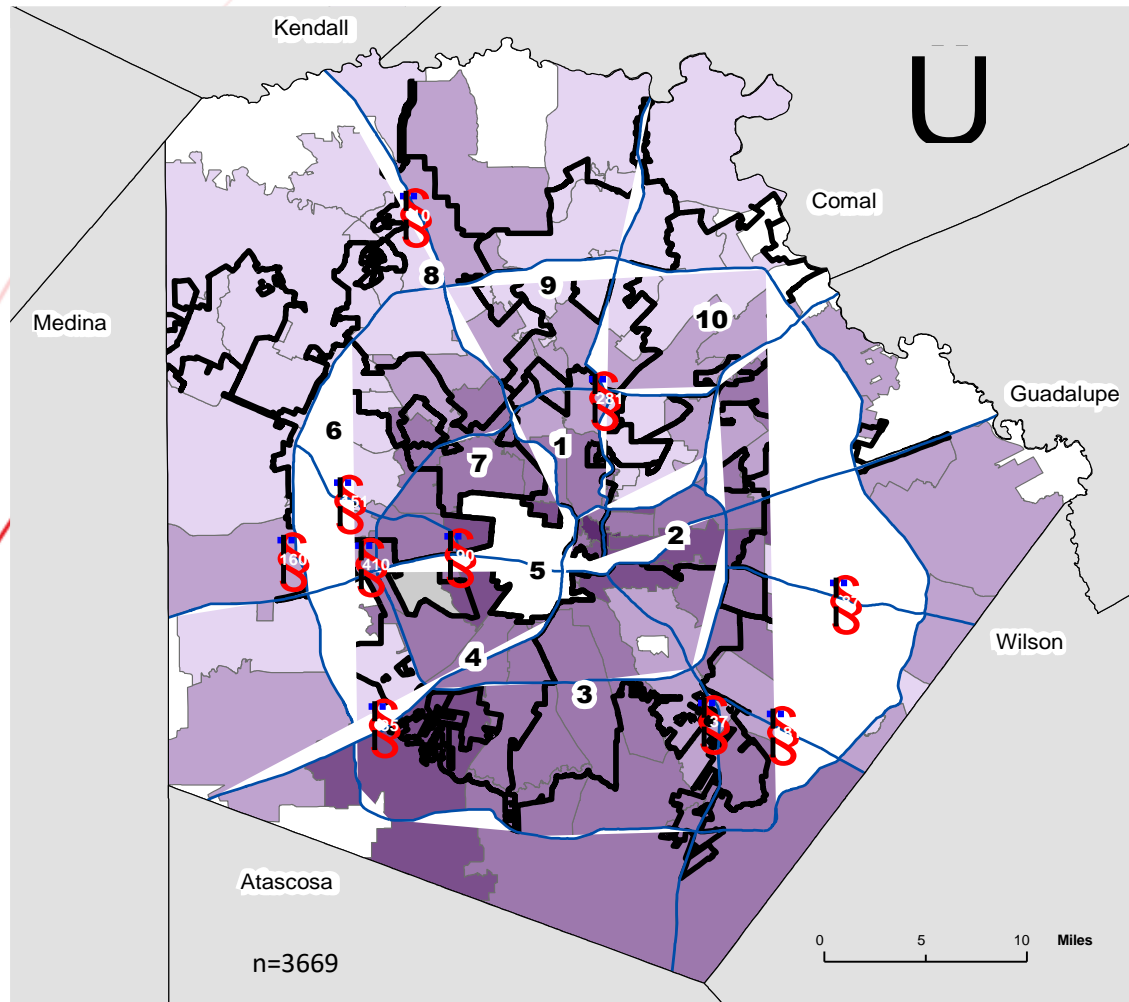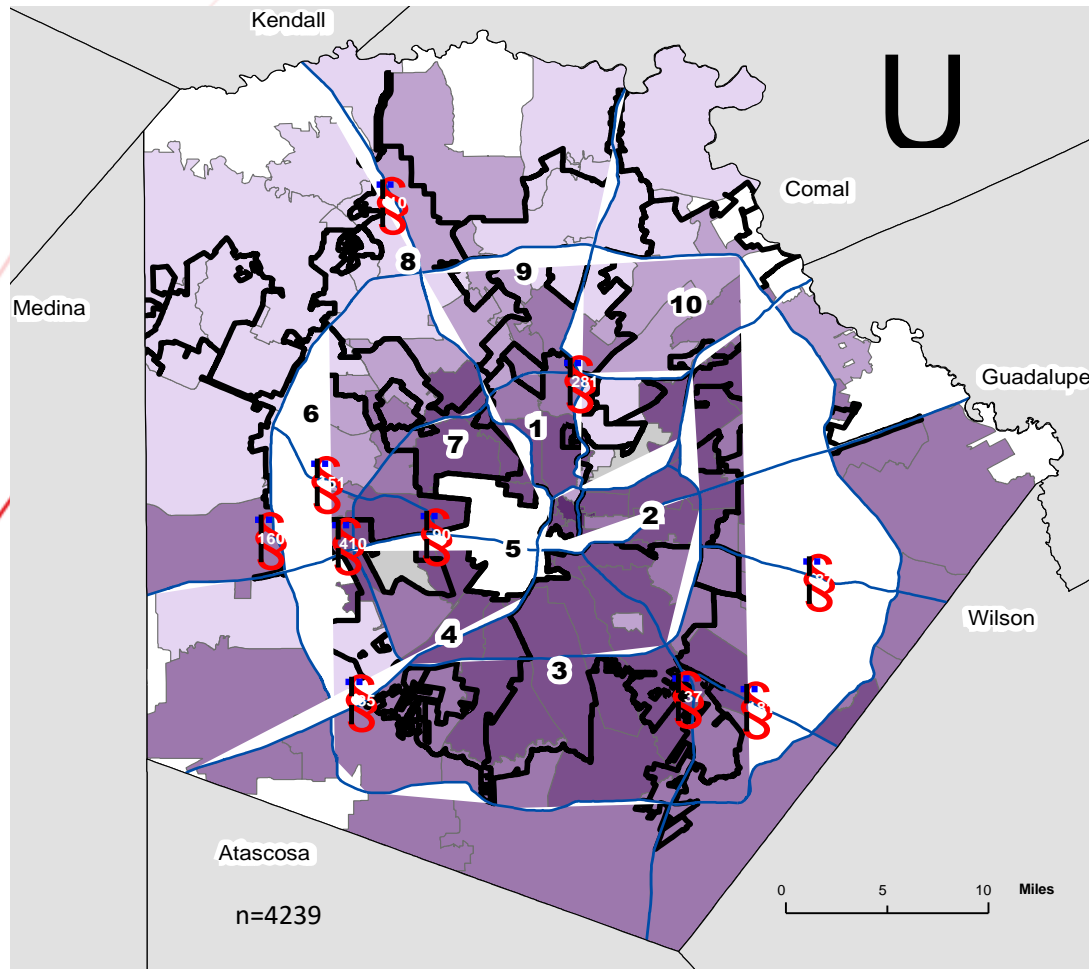

Note: This is all types of Diabetes
Source: Case data source: 2015 Hospital Discharge Public Use Data Base 1 File.
Population data source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Accessed 8/13/2018.

Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2016

Legend

Diabetes rates/10,000 population by ZCTA

- Suppressed zip code data
- 1.6 - 11.3
- 11.4 - 21.6
- 21.7 - 35.5
- 35.6 - 58.4
- 58.5 - 103.7
- Council Districts
- Military Bases & Inner Cities
- Major Highways
- Bexar County
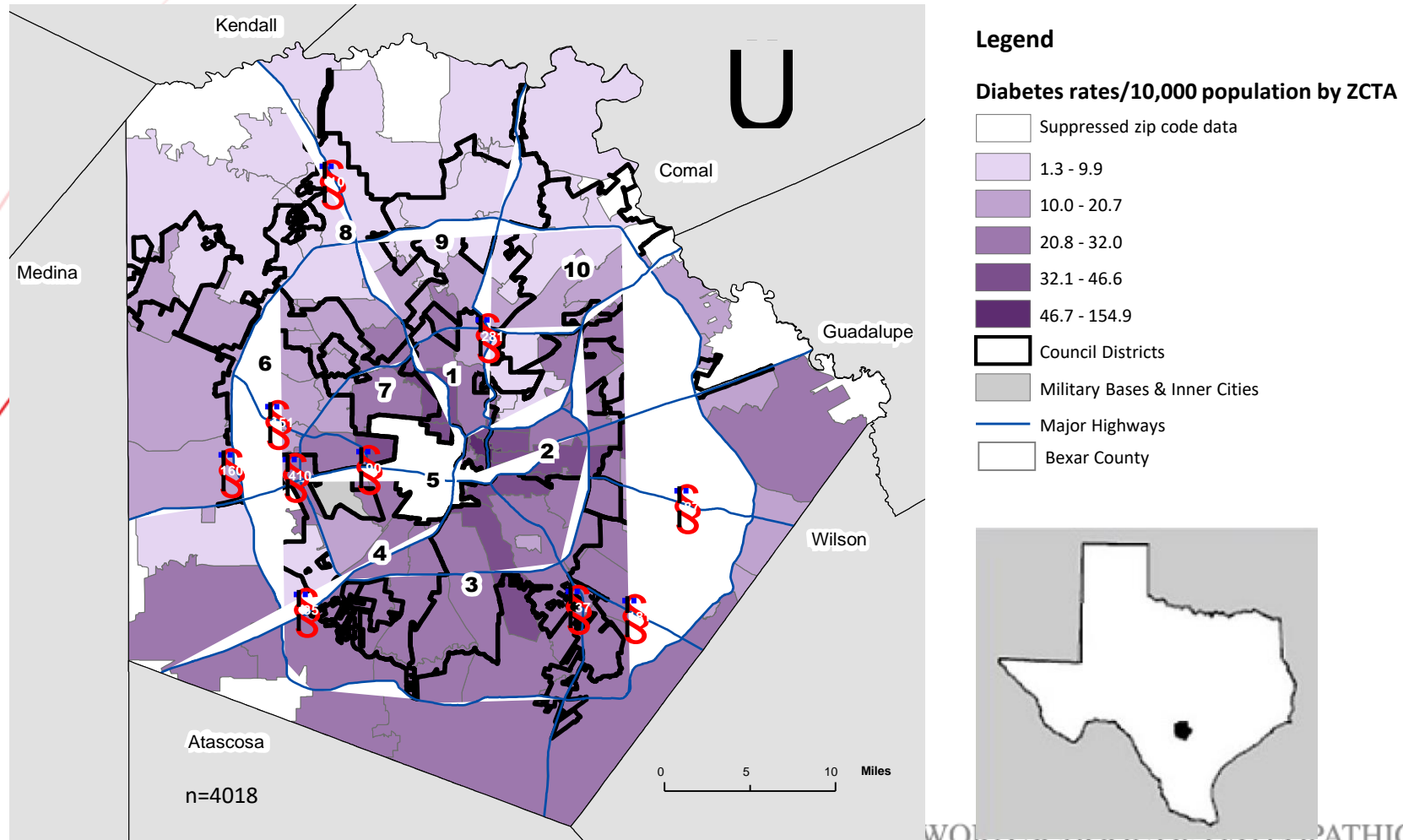
n=4406

0   5   10   **Miles**
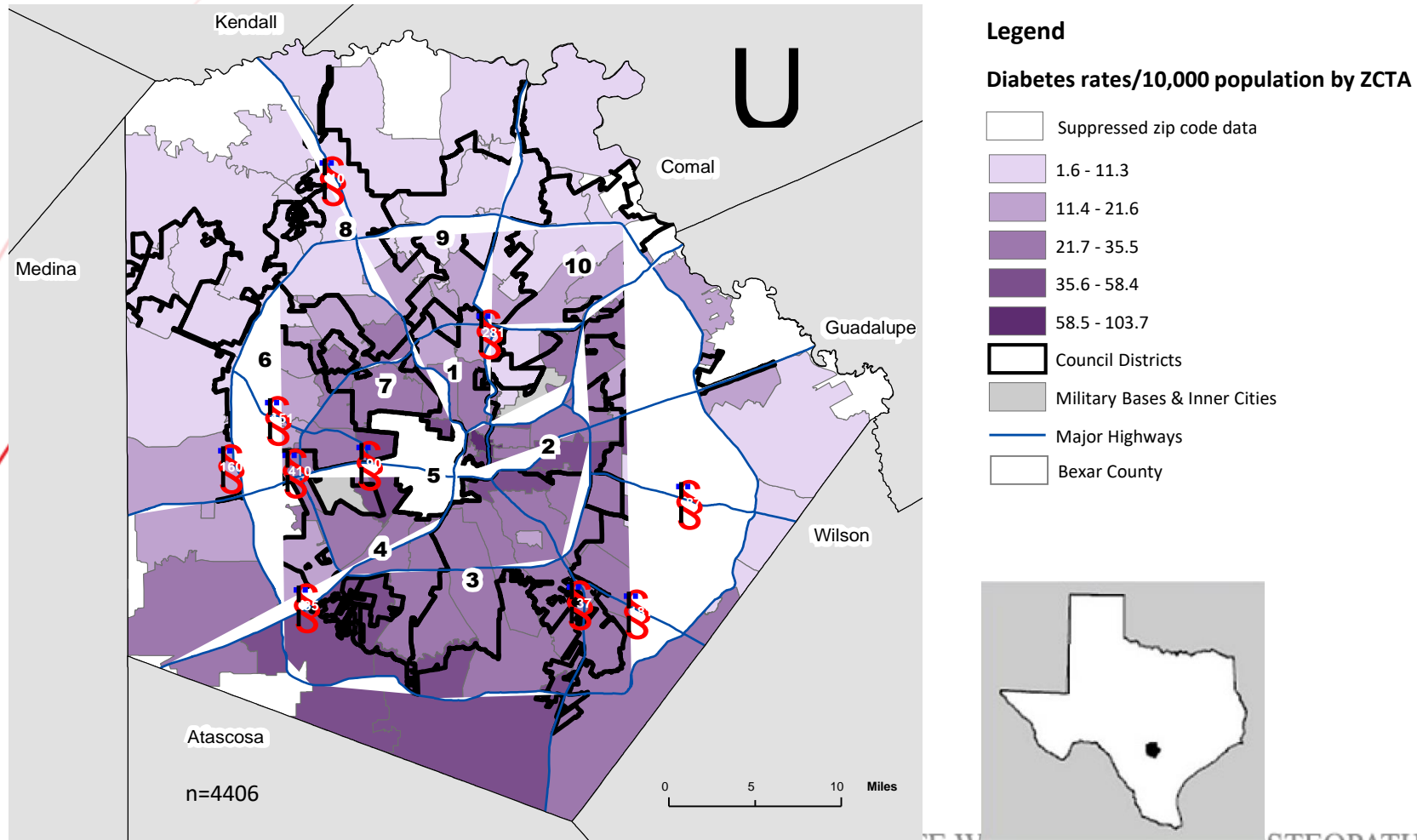
Note: This is all types of Diabetes

Source: Case data source: 2016 Hospital Discharge Public Use Data Base 1 File.

Population data source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Accessed 8/13/2018.

Diagnosed and undiagnosed diabetes among people 18 years or older, Bexar County, 2014

194,556 or 14.2% of adults have diabetes

54,087 adults may be undiagnosed diabetics

479,540 or 35% of adults are pre-diabetic

439,807 or 32.1% of adults in Bexar County are Obese

Diabetes

Source: Texas BRFSS 2014, Summary Table, Bexar County - Weighted Data, Has a doctor, nurse, or other health professional ever told you that you have diabetes? Population 18 and older 2014 American Community Survey 1-Year Estimates

Type 1 Diabetes: DCCT

Adapted with permission from Skyler J. *Endocrinol Metab Clin North Am.* 1996;25:243
Diabetes Control and Complications Trial (DCCT) Research Group. *N Engl J Med.* 1993;329:977
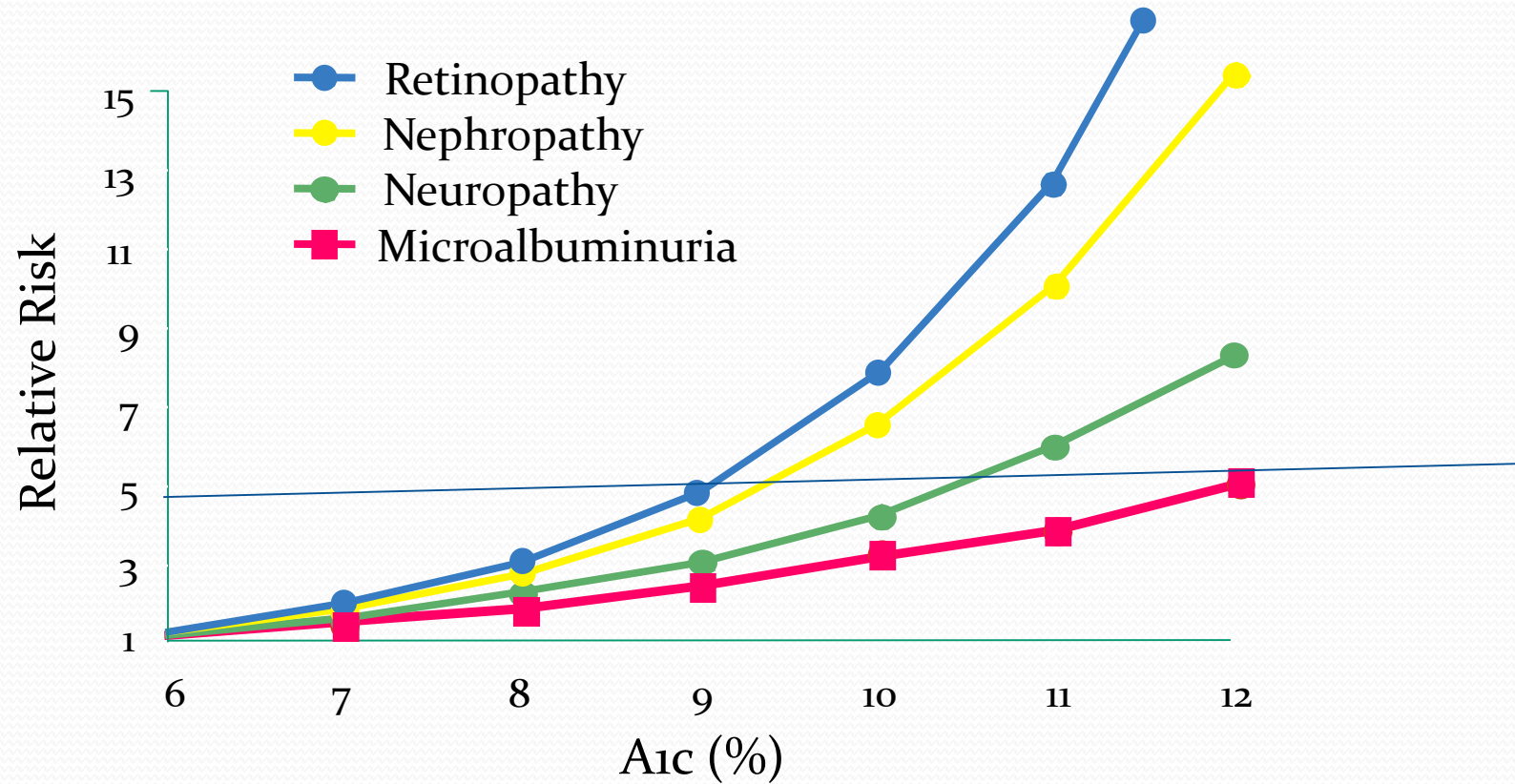
Texas Hospital Inpatients Diagnosed with Diabetes or Diabetic Amputations by County, 2014

	Population	Diagnosis of Diabetes	Rate per 1,000	Diabetics Amputations	Rate per 1,000
Harris	4,447,577	98,573	22.2	2,804	28.4
Bexar	1,860,274	47,702	25.6	1,909	40.0
Dallas	2,519,625	56,801	22.5	1,854	32.6
Tarrant	1,946,346	41,516	21.3	1,277	30.8
Hidalgo	831,561	23,464	28.2	712	30.3
El Paso	835,545	22,041	26.4	622	28.2
Travis	1,150,996	17,670	15.4	591	33.4
Nueces	356,494	11,766	33.0	489	41.6
Cameron	420,400	12,993	30.9	375	28.9
Collin	886,052	12,978	14.6	343	26.4
Texas	26,979,078	649,761	24.1	20,927	32.2

Source: Hospital Discharge Texas Hospital Inpatient Discharge Public Use Data File. Texas Department of State Health Services, Center for Health Statistics, Hospital Discharge principal or other Diagnosis of diabetes or surgical or other procedure, ICD-9 code Diabetes mellitus 250, ICD-9-CM Amputations Procedure Code 84

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Percent Diagnosed with Diabetes By Education, Bexar County

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Source: U.S. Centers for Disease Control and Prevention (CDC), Behavioral Risk Factor Surveillance System (BRFSS), Bexar County, 2014
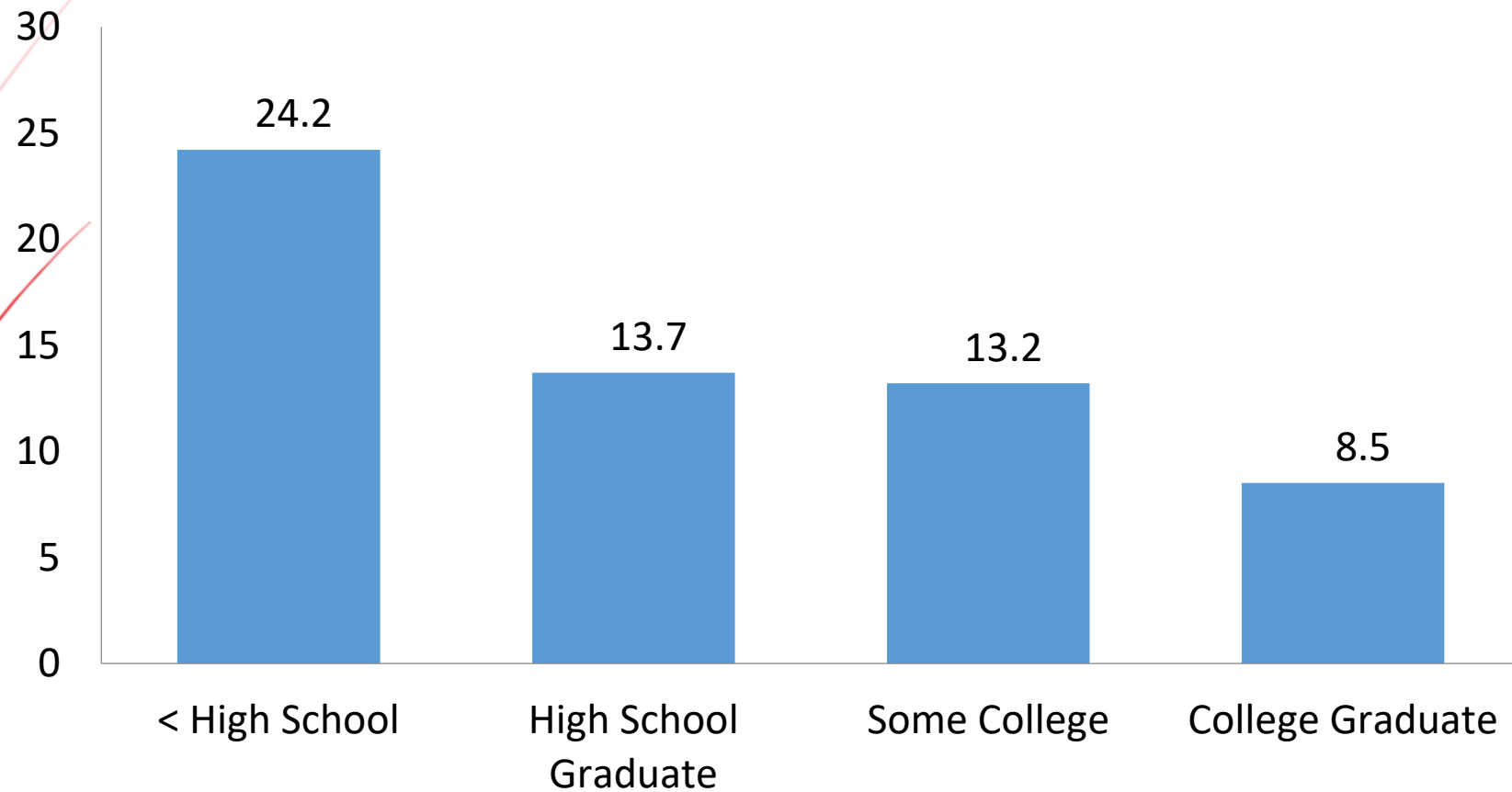
HbA1c Control in patients within Bexar County by Age Group
n=13,856
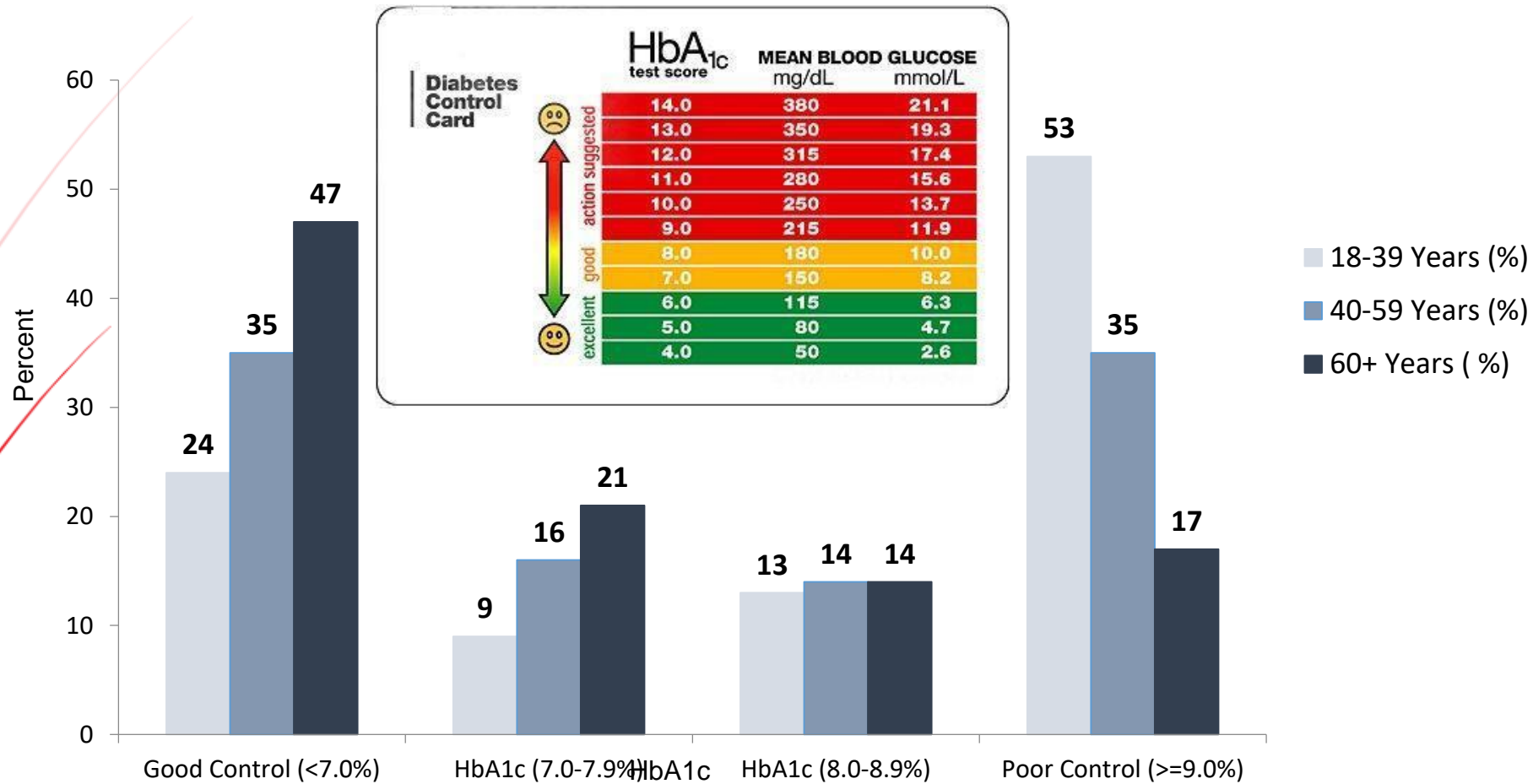
Using Systems Science to Inform Population Health Strategies in Local Health Departments: A Case Study in San Antonio, Texas

Yan Li, PhD[1,2], Norma A. Padrón, PhD[3], Anil T. Mangla, PhD[4],
Pamela G. Russo, MD[5], Thomas Schlenker, MD[6], and José A. Pagán, PhD[1,7,8]

Diabetes Prevention could save San Antonio $400 Million

San Antonio –A San Antonio-based, simulation model recently presented in the national journal Public Health Reports predicted the implementation of a diabetes prevention program would save $400 million over 20 years for the city in health care related costs. In "Using Systems Science to Inform Population Health Strategies in Local Health Departments: A Case Study in San Antonio, Texas", co-authors Drs. Thomas Schlenker and Anil T. Mangla of The University of the Incarnate Word, School of Osteopathic Medicine (UIWSOM) demonstrated lowering the diabetic population blood A1c levels by 1% resulted in significant reductions in annual cases of kidney failure (97), amputations (215), blindness (577), myocardial infarctions (780), and strokes

Projection of Complications from Diabetes Among Adults with Prediabetes or Diabetes in San Antonio in 20 Years
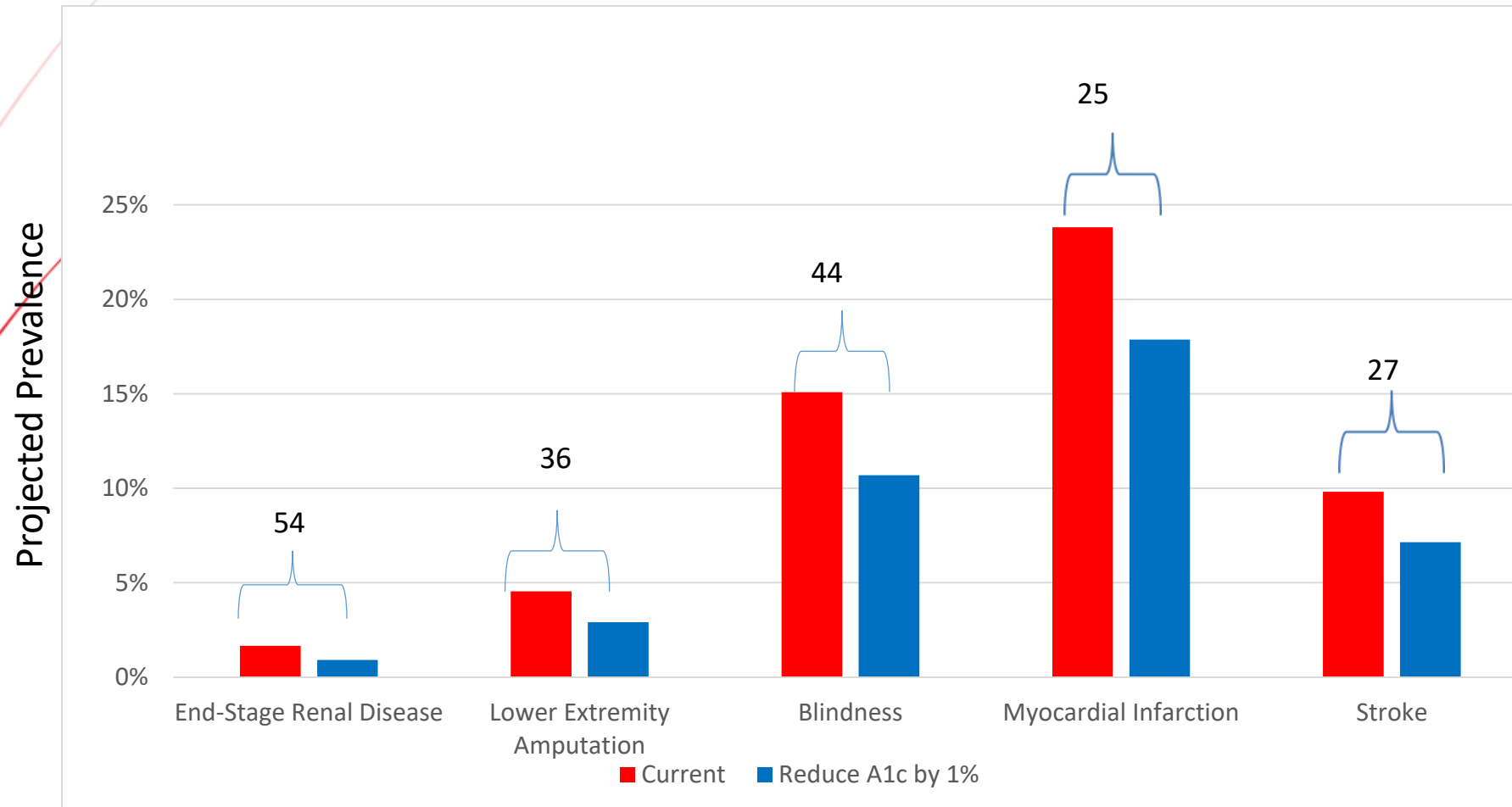
Projection of Chronic Health Conditions and their Consequences among Adults in San Antonio in Years
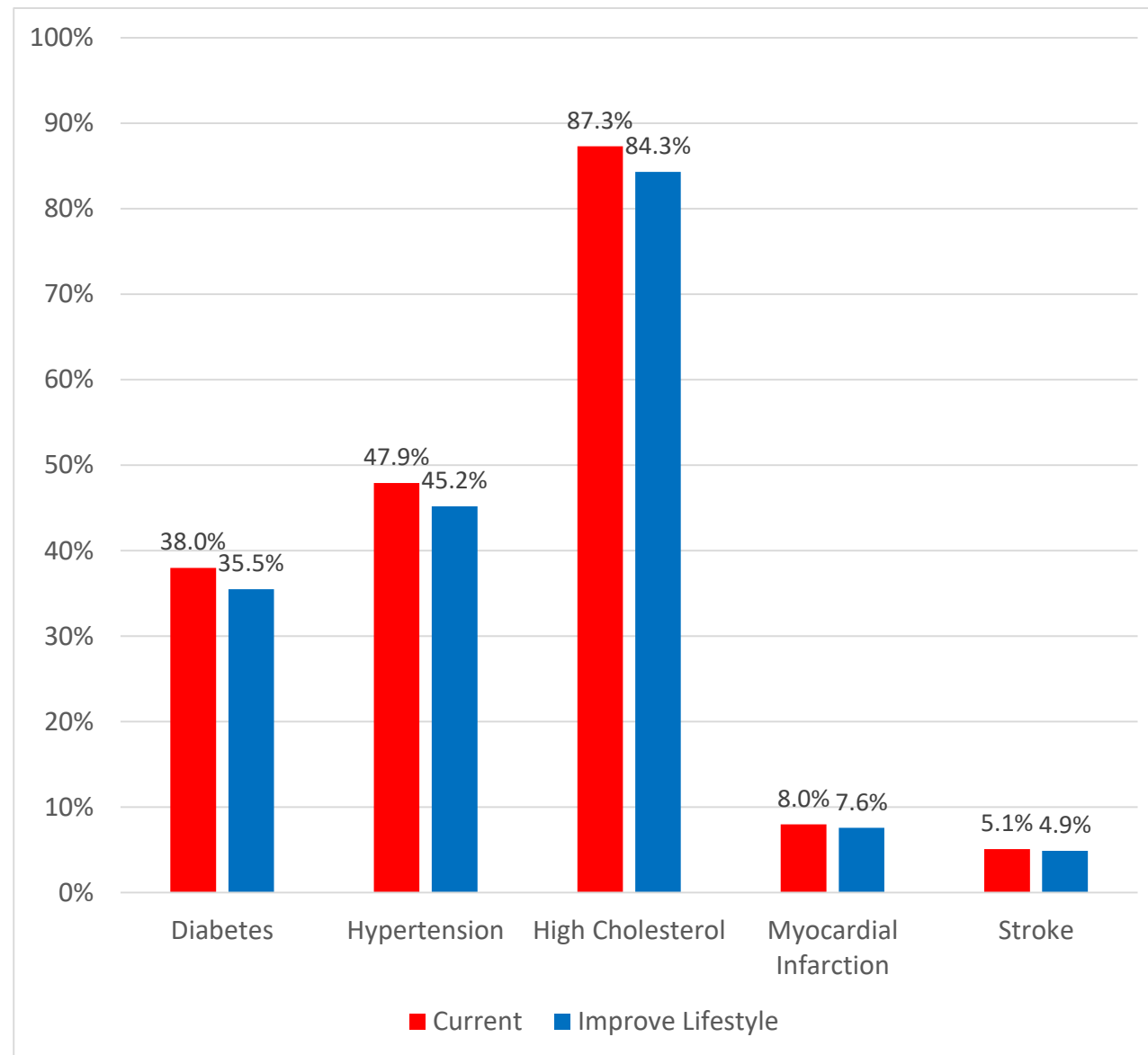
Cost Saving Projection from Reducing A1c by 1% among Adults with Pre-diabetes or Diabetes in San Antonio in 20 Years

	End-Stage Renal Disease	Lower Extremity Amputation	Proliferative Retinopathy	Myocardial Infarction	Stroke	Total Cost Savings
Averted Incidence	1,942	4,304	11,548	15,616	6,981	
Annual Costs (per person)	$28,874	$16,010	$9,003	$7,569	$8,929	
Annual Cost Savings	$56 Million	$68 Million	$103 Million	$118 Million	$62 Million	$409 Million

Bexar County and District 3

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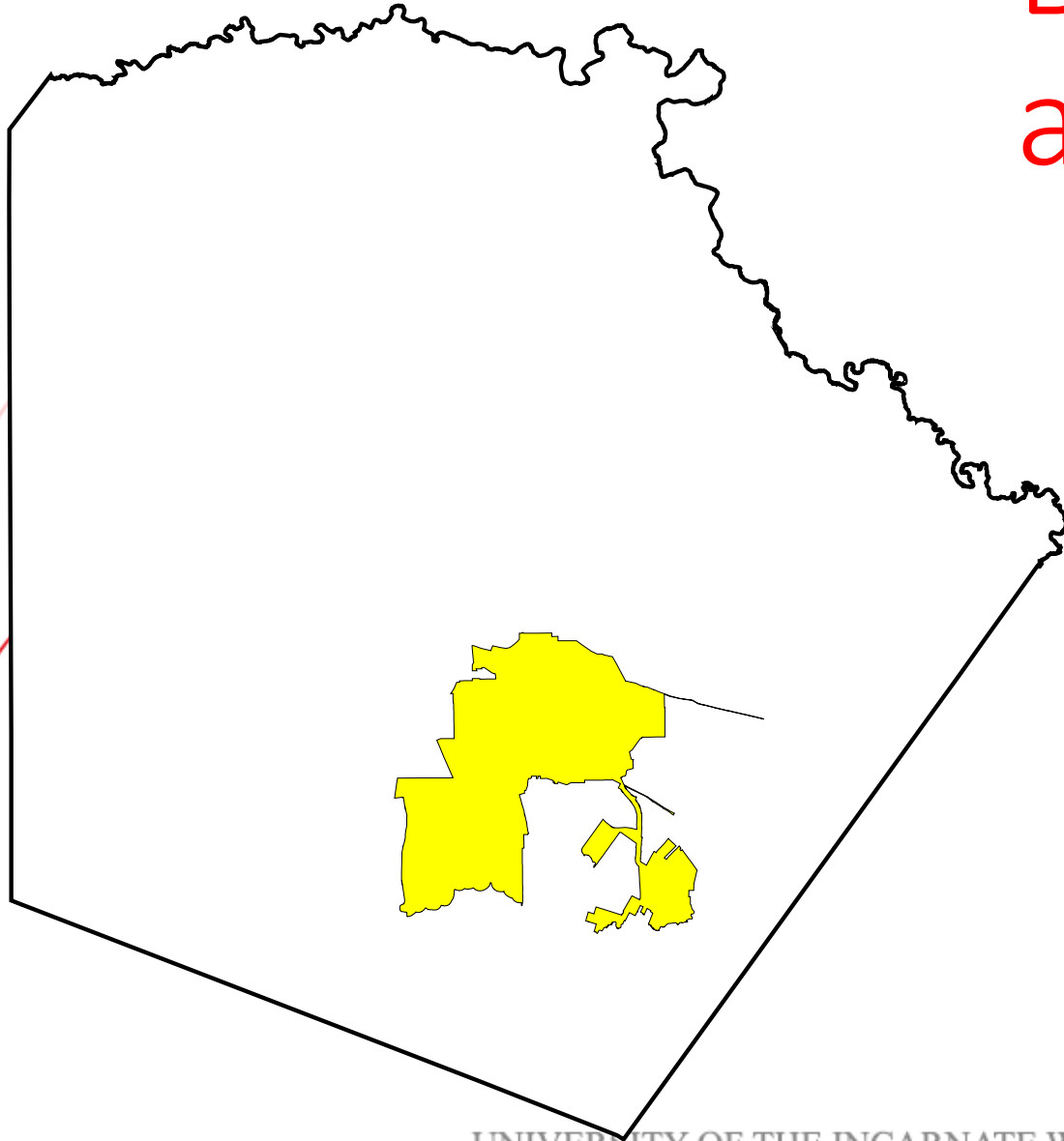
Patients with Diagnosed with Diabetes, and Diabetes Related Chronic Kidney Disease, Counts and Rates by Locality, 2011

Locality	Number of Diagnosed Diabetes Related Chronic Kidney Disease	Rate**
Texas	171,262	290.8
Bexar County	15,392	334.6
District 3	3,052	377.6

2011 Hospital Discharge principal or other Diagnosis
**Rate per 1,000 of diagnosed diabetics

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Diabetes Related Amputations, Counts and Rates by Locality, 2011

Locality	Number Diabetes Relatated Amputations	Rate**
Texas	18157	30.8
Bexar County	1944	42.3
District 3	364	45.0

2011 Hospital Discharge principal or other Diagnosis
**Rate per 1,000 of diagnosed diabetics

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Patients with Diagnosed Diabetes Related End stage renal disease Counts and Rates by Locality, 2011

Locality	Number of Diagnosed Diabetes Related End stage renal disease	Rate**
Texas	61,870	105.0
Bexar County	5,616	122.1
District 3	1,240	153.4

**Rate per 1,000 of diagnosed diabetics
Source: 2011 Hospital Discharge principal or other Diagnosis

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Educational Attainment Population
25 years and over

	National		Texas		Bexar County		District 3	
Less than High School	29,179,819	14%	3,031,189	19%	193,202	18%	22,633	31%
High School or GED	57,706,852	28%	3,986,617	25%	260,961	24%	25,082	34%
Some college	59,244,324	29%	4,607,434	29%	335,207	31%	19,242	26%
Bachelors	36,529,875	18%	2,761,112	18%	177,033	17%	4,515	6%
Graduate or more	21,675,147	11%	1378696	9%	99127	9%	1544	2%
Total	204,336,017	100%	15,765,048	100%	1,065,530	100%	73,016	100%

The questions on educational attainment apply only to progress in "regular" schools. Such schools include graded public, private, and parochial elementary and high schools (both junior and senior high schools), colleges, universities, and professional schools, whether day schools or night schools. Thus, regular schooling is that which may advance a person toward an elementary school certificate or high school diploma, or a college, university, or professional school degree. Schooling in other than regular schools was counted only if the credits obtained are regarded as transferable to a school in the regular school system.

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CITY OF SAN ANTONIO
METROPOLITAN HEALTH DISTRICT

Source: U.S. Census Bureau, 2008-2012 American Community Survey

Similar studies

This project was designed to resemble the successful Presa Community Center Project Puente [PCCP] that was implemented in the East side. The PCCP focused on low income patients hospitalized for cardiovascular disease and diabetes complications. Four interventions were performed and the results were significant:

Patients were assessed for depression, psycho-social stressors and health related quality of life

Help patient and caregivers understand treatment plans

Facilitate patient attendance at follow-up appointments

Help identify and eliminate the barriers to successful completion of health care plans.

PCCP Results

- 32 readmissions prevented @ cost of $11,371 per readmission= $367,000 saved

- 70% improved mental health scores

- 26% improved comprehensive wellness

- 55% improved social role

- A major challenge met was loss to follow up, however collaborating with a private clinic and implementing student home visits in this project should mitigate that problem.

Roadmap

Staff
Recruiting

Identify Committee
3 Faculty
3 Community
3 Learners

Assessment
1

Assessment
2

Assessment
3

Assessment
4

Due :
1.Data Analysis
2.Submission of manuscript

| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 16 |

| Jan 2019 | Feb | March | April | May | June | July | Aug | Sept | Oct | Nov | Dec | April 2020 |

Start

Q1

Q2

Q3
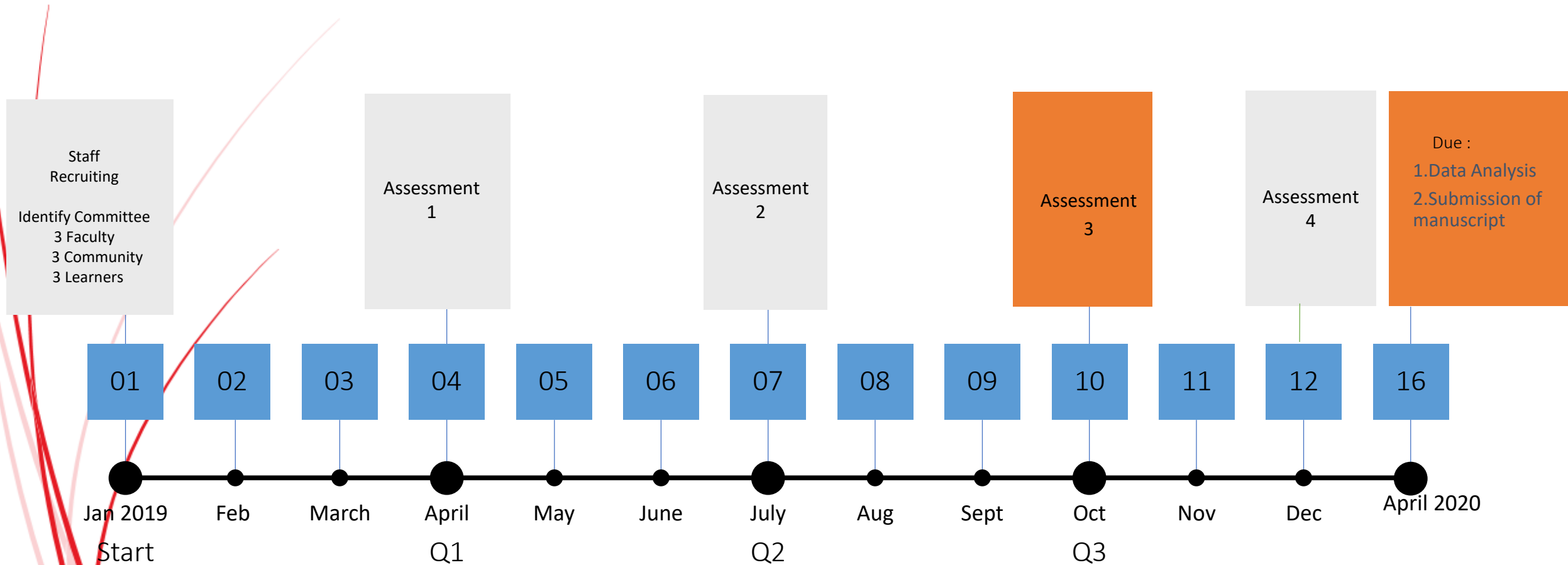
Identifying and Reducing Diabetic-Related Foot Amputations in District 3, San Antonio

```
┌─────────────────────┐     ┌──────────────────────────────┐     ┌──────────────────────────┐
│ Saveclinic          │     │ Identify Total 600 candidates │     │      Assessments          │
│                     │ ──▶ │          (15%)               │ ──▶ │                          │
│ 80 patients per week│     │                              │     │  1. Wellness              │
│                     │     │   40-50 patients per week    │     │  2. Depression            │
└─────────────────────┘     │                              │     │  3. HbA1c                 │
                            │  4 learners X 4 assessments  │     │  4. Lipid analysis        │
                            │   X 3 per week = 48          │     │  5. Cohort Reviews        │
                            └──────────────────────────────┘     └──────────────────────────┘
```

1	2	3	4
2 calls / 2 home visits per Month	Info to SAVE	La Mision	Analysis

OUTCOMES

1. Decrease ER visits
2. Improve HbA1c
3. Decrease Foot Amputations
4. Economic Benefit (Before and After)

This project's strategy will implement a comprehensive care approach through regular home visits in an effort to evaluate four key project outcomes:

1. Reduction in ER visits after 1 year

2. Assisting, monitoring, and improving mental health which will improve HbA1c scores

3. Identifying economic benefit of the project

4. Reducing diabetic-related foot amputations after 1 year

There are 5 stages in this project:

- Stage 1: The [UIWSOM] will collaborate with the Dr. Lyssa Ochoa, San Antonio Vascular and Endovascular Clinic to reduce or avoid first and second amputations in diabetic patients, provide a mental health and comprehensive wellness assessments.

- Stage 2: Patients that provide consent, will be followed longitudinally [2 home visits per month] by medical students through the guidance of a promotora [Community Health Worker] to identify the key components that physicians do not have the time to identify and investigate

There are 5 stages in this project:

- Stage 3: The students will provide real-time information to the SAVE Clinic surgeon on social determinants of health that were identified and provide resources to close the gap with each particular SDH attributed to each patient.

- Stage 4: For mental health assessments, counseling will be offered by the UIWSOM. If we identify cases that require special interventions and treatment, those patients will be referred to La Mision, Daughters of Charity.

- Stage 5: Prepare a programmatic outcomes analysis

Conclusions

We projected that a 1-percentage-point reduction in HbA1c would lead to a decrease in the 20-year prevalence of end-stage renal disease from 1.7% to 0.9%, lower extremity amputation from 4.6% to 2.9%, blindness from 15.1% to 10.7%, myocardial infarction from 23.8% to 17.9%, and stroke from 9.8% to 7.2%.

We estimated annual direct medical cost savings (in 2015 US dollars) from reducing HbA1c by 1 percentage point ranging from $6842 (myocardial infarction) to $39 800 (end- stage renal disease) for each averted case of diabetes complications.

Thank You

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School of Osteopathic Medicine

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http://www.uiw.edu/som/about/facultystaff/anilmangla.html