TAHFA-South Texas HFMA Fall Symposium
Tuesday, September 25\textsuperscript{th}, 2018

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• 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

² Bradley EH., Health Aff 2016;35:760-768
Health starts where we live, learn, work and play.

WHAT MAKES US HEALTHY?

20% Health Behaviors

20% Clinical Care

5% Genes and Biology

55% Social and Economic Factors

Adapted from http://www.cdc.gov/socialdeterminants/FAQ.html
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.
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

All States Median - 9.1
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)

- 1994
- 2000
- 2015

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

• 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

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

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

Note: This is all types of Diabetes

Source: Case data source: 2012 Hospital Discharge Public Use Data Base 1 File.
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

Kendall
Comal
Guadalupe
Wilson
Atascosa
Medina

Note: This is all types of Diabetes
Source: Case data source: 2013 Hospital Discharge Public Use Data Base 1 File.
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

Note: This is all types of Diabetes
Source: Case data source: 2014 Hospital Discharge Public Use Data Base 1 File.
Rate of Diabetes Per 10,000 Population in Hospital Discharge Data for Bexar County, 2015

Legend

Diabetes rates/10,000 population by ZCTA

- Suppressed zip code data
- 4.5 - 9.6
- 9.7 - 16.3
- 16.4 - 25.7
- 25.8 - 48.0
- 48.1 - 230.8

Council Districts
Military Bases & Inner Cities
Major Highways
Bexar County

Note: This is all types of Diabetes
Source: Case data source: 2015 Hospital Discharge Public Use Data Base 1 File.
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

Note: This is all types of Diabetes
Source: Case data source: 2016 Hospital Discharge Public Use Data Base 1 File.
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

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
# Texas Hospital Inpatients Diagnosed with Diabetes or Diabetic Amputations by County, 2014

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

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
Percent Diagnosed with Diabetes By Education, Bexar County

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

<table>
<thead>
<tr>
<th>HbA1c Control</th>
<th>18-39 Years (%)</th>
<th>40-59 Years (%)</th>
<th>60+ Years (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Control  (&lt;7.0%)</td>
<td>24</td>
<td>35</td>
<td>47</td>
</tr>
<tr>
<td>HbA1c (7.0-7.9%)</td>
<td>16</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>HbA1c (8.0-8.9%)</td>
<td>13</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Poor Control  (&gt;=9.0%)</td>
<td>53</td>
<td>35</td>
<td>17</td>
</tr>
</tbody>
</table>
Using Systems Science to Inform Population Health Strategies in Local Health Departments: A Case Study in San Antonio, Texas

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

- End-Stage Renal Disease: 54%
- Lower Extremity Amputation: 36%
- Blindness: 44%
- Myocardial Infarction: 25%
- Stroke: 27%

Current vs. Reduce A1c by 1%
Projection of Chronic Health Conditions and their Consequences among Adults in San Antonio in Years

- Diabetes: 38.0% Current, 35.5% Improve Lifestyle
- Hypertension: 47.9% Current, 45.2% Improve Lifestyle
- High Cholesterol: 87.3% Current, 84.3% Improve Lifestyle
- Myocardial Infarction: 8.0% Current, 7.6% Improve Lifestyle
- Stroke: 5.1% Current, 4.9% Improve Lifestyle

Current: Red
Improve Lifestyle: Blue
Cost Saving Projection from Reducing A1c by 1% among Adults with Pre-diabetes or Diabetes in San Antonio in 20 Years

<table>
<thead>
<tr>
<th></th>
<th>End-Stage Renal Disease</th>
<th>Lower Extremity Amputation</th>
<th>Proliferative Retinopathy</th>
<th>Myocardial Infarction</th>
<th>Stroke</th>
<th>Total Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Averted Incidence</strong></td>
<td>1,942</td>
<td>4,304</td>
<td>11,548</td>
<td>15,616</td>
<td>6,981</td>
<td></td>
</tr>
<tr>
<td><strong>Annual Costs (per person)</strong></td>
<td>$28,874</td>
<td>$16,010</td>
<td>$9,003</td>
<td>$7,569</td>
<td>$8,929</td>
<td></td>
</tr>
<tr>
<td><strong>Annual Cost Savings</strong></td>
<td>$56 Million</td>
<td>$68 Million</td>
<td>$103 Million</td>
<td>$118 Million</td>
<td>$62 Million</td>
<td>$409 Million</td>
</tr>
</tbody>
</table>
Bexar County and District 3
Patients with Diagnosed with Diabetes, and Diabetes Related Chronic Kidney Disease, Counts and Rates by Locality, 2011

<table>
<thead>
<tr>
<th>Locality</th>
<th>Number of Diagnosed Diabetes Related Chronic Kidney Disease</th>
<th>Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>171,262</td>
<td>290.8</td>
</tr>
<tr>
<td>Bexar County</td>
<td>15,392</td>
<td>334.6</td>
</tr>
<tr>
<td>District 3</td>
<td>3,052</td>
<td>377.6</td>
</tr>
</tbody>
</table>

2011 Hospital Discharge principal or other Diagnosis

**Rate per 1,000 of diagnosed diabetics
Diabetes Related Amputations, Counts and Rates by Locality, 2011

<table>
<thead>
<tr>
<th>Locality</th>
<th>Number Diabetes Related Amputations</th>
<th>Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>18157</td>
<td>30.8</td>
</tr>
<tr>
<td>Bexar County</td>
<td>1944</td>
<td>42.3</td>
</tr>
<tr>
<td>District 3</td>
<td>364</td>
<td>45.0</td>
</tr>
</tbody>
</table>

**2011 Hospital Discharge principal or other Diagnosis
**Rate per 1,000 of diagnosed diabetics
Patients with Diagnosed Diabetes Related End stage renal disease Counts and Rates by Locality, 2011

<table>
<thead>
<tr>
<th>Locality</th>
<th>Number of Diagnosed Diabetes Related End stage renal disease</th>
<th>Rate**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>61,870</td>
<td>105.0</td>
</tr>
<tr>
<td>Bexar County</td>
<td>5,616</td>
<td>122.1</td>
</tr>
<tr>
<td>District 3</td>
<td>1,240</td>
<td>153.4</td>
</tr>
</tbody>
</table>

**Rate per 1,000 of diagnosed diabetics
Source: 2011 Hospital Discharge principal or other Diagnosis
# Educational Attainment Population
25 years and over

<table>
<thead>
<tr>
<th>Educational Attainment</th>
<th>National</th>
<th>Texas</th>
<th>Bexar County</th>
<th>District 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than High School</td>
<td>29,179,819</td>
<td>3,031,189</td>
<td>193,202</td>
<td>22,633</td>
</tr>
<tr>
<td>High School or GED</td>
<td>57,706,852</td>
<td>3,986,617</td>
<td>260,961</td>
<td>25,082</td>
</tr>
<tr>
<td>Some college</td>
<td>59,244,324</td>
<td>4,607,434</td>
<td>335,207</td>
<td>19,242</td>
</tr>
<tr>
<td>Bachelors</td>
<td>36,529,875</td>
<td>2,761,112</td>
<td>177,033</td>
<td>4,515</td>
</tr>
<tr>
<td>Graduate or more</td>
<td>21,675,147</td>
<td>1378696</td>
<td>99127</td>
<td>1544</td>
</tr>
<tr>
<td>Total</td>
<td>204,336,017</td>
<td>15,765,048</td>
<td>1,065,530</td>
<td>73,016</td>
</tr>
</tbody>
</table>

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.

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

UNIVERSITY OF THE INCARNATE WORD SCHOOL OF OSTEOPATHIC MEDICINE
Identifying and Reducing Diabetic-Related Foot Amputations in District 3, San Antonio

Identify Total 600 candidates (15%)
40-50 patients per week
4 learners X 4 assessments X 3 per week = 48

Assessments
1. Wellness
2. Depression
3. HbA1c
4. Lipid analysis
5. Cohort Reviews

Saveclinic
80 patients per week

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
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.