

# MEALS ON WHEELS ANALYSIS FINAL FINDINGS

Oct 12, 20 17

# Agenda

1. Executive summary
2. Overview of impact of a meal & associated costs
3. MoW impact - wireframe storyboard

# Executive Summary

- The estimated value of a VNA meal is AT LEAST \$8.87, resulting in a 48% ROI\* on the meal investment and has the potential to lower healthcare costs by 7% annually for the conditions modelled
- The level of detail we were able to model for different conditions will allow VNA to target discussions with different stakeholders with specific areas of interest
- Of the estimated overall \$2,218 in health care savings achieved through the MOWs program the top contributors accounting for the cost savings were :
  - Cardiovascular\*\* conditions accounting for 21%
  - Dementia accounting for 25%
  - Home health and SNF utilization accounting for 48%
- Loneliness had a 25% reduction in prevalence, the largest out of the measure categories

\* 48% ROI assumes a \$6/meal cost

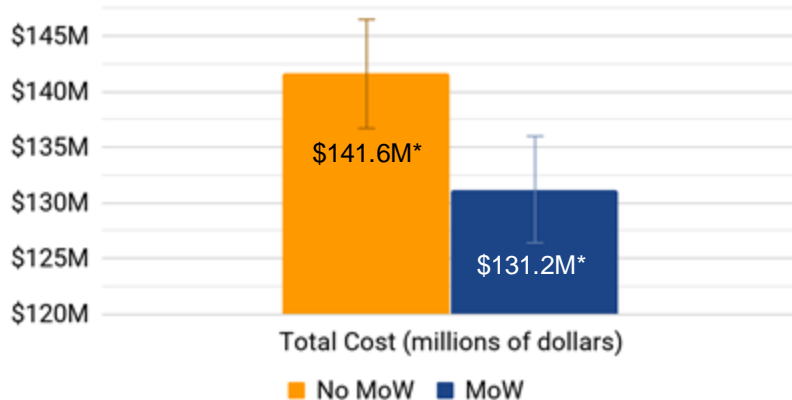
\*\*Conditions include: stroke, heart attack, congestive heart failure with and without hospitalization, coronary heart disease and hypertension

# Impact of Meals on Wheels on the Dallas Community

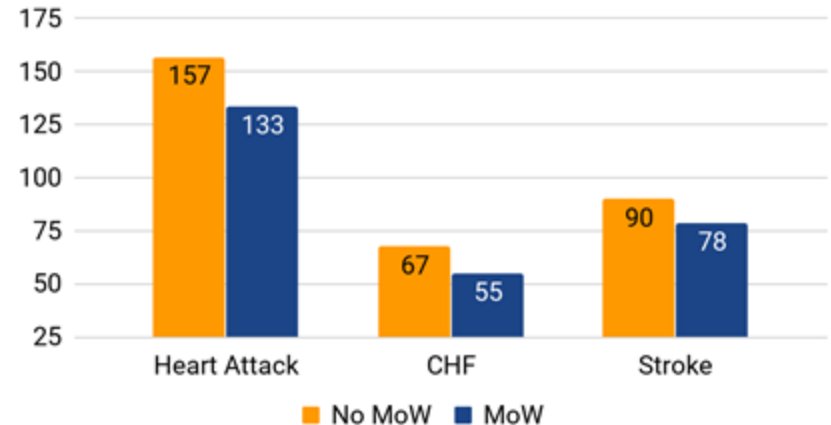
# MoW on Average Reduces Healthcare Costs for Beneficiaries by 7% for Assessed Conditions

- Across 4,700 clients, VNA saves an estimated \$10.4M annually in health costs for its clients with savings of \$2,218 per client for the conditions assessed on an estimated \$30,137 per year, on average
- An estimated 24 fewer heart attacks, 12 fewer congestive heart failure hospitalizations, and 12 fewer strokes annually across VNA's current client base when looking at the impact across conditions assessed

Total cost per year for Dallas MoW population (N=4700)



No. of hospitalizations per year for Dallas MoW population



\*Bars denote potential range of variation in total cost

# Demographics of VNA's Simulated Population

Our virtual population was developed to reflect clients served by VNA's MOW program

If there was more client data available, the model could have been more representative of the actual population

Key VNA client population characteristics:

- The population was held constant for having a low income
- Did not model clients under the age of 60

| Gender | Percent |
|--------|---------|
| Female | 65%     |
| Male   | 35%     |

| Age     | Percent |
|---------|---------|
| 60 - 69 | 68%     |
| 70 - 79 | 32%     |

| Ethnicity          | Percent |
|--------------------|---------|
| Black/Not Hispanic | 50%     |
| White/Not Hispanic | 38%     |
| Hispanic           | 11%     |
| Other              | 2%      |

# Research Used to Model Impact of MoW on Malnutrition and Weight

## MoW effect on Malnutrition

- Reduces malnutrition by 83%<sup>1</sup>
- Increases normal nutrition by 72%<sup>1</sup>

**TABLE 1** Results of a Home-Delivered Meal Program for Seniors

| Measure             | Pre   | Post  |
|---------------------|-------|-------|
| Nutritional Status: |       |       |
| Normal Status       | 8.1%  | 29.4% |
| At Risk Status      | 58.1% | 64.7% |
| Malnourished        | 33.9% | 5.9%  |

*Reproduced from Epps et al. 2015*

1. <https://www.ncbi.nlm.nih.gov/pubmed/26106989>

2. <https://www.ncbi.nlm.nih.gov/pubmed/27091846>

## MoW effect on Weight

- Reduces obesity by 35%<sup>2</sup>
- Increases underweight by 34%<sup>2</sup>

**TABLE 2** Characteristics of the Total Sample at Each Measurement Time Point

|                   | Percentages of study sample at |                       |                       |
|-------------------|--------------------------------|-----------------------|-----------------------|
|                   | Initial<br>(n = 212)           | 6 months<br>(n = 100) | 12 months<br>(n = 69) |
| Weight status (%) |                                |                       |                       |
| Underweight       | 7.1                            | 6.4                   | 9.5                   |
| Normal weight     | 30.5                           | 34.4                  | 38.1                  |
| Overweight        | 31.0                           | 30.1                  | 31.8                  |
| Obese             | 31.5                           | 29.0                  | 20.6                  |

*Reproduced from Wolfe et al. 2015*

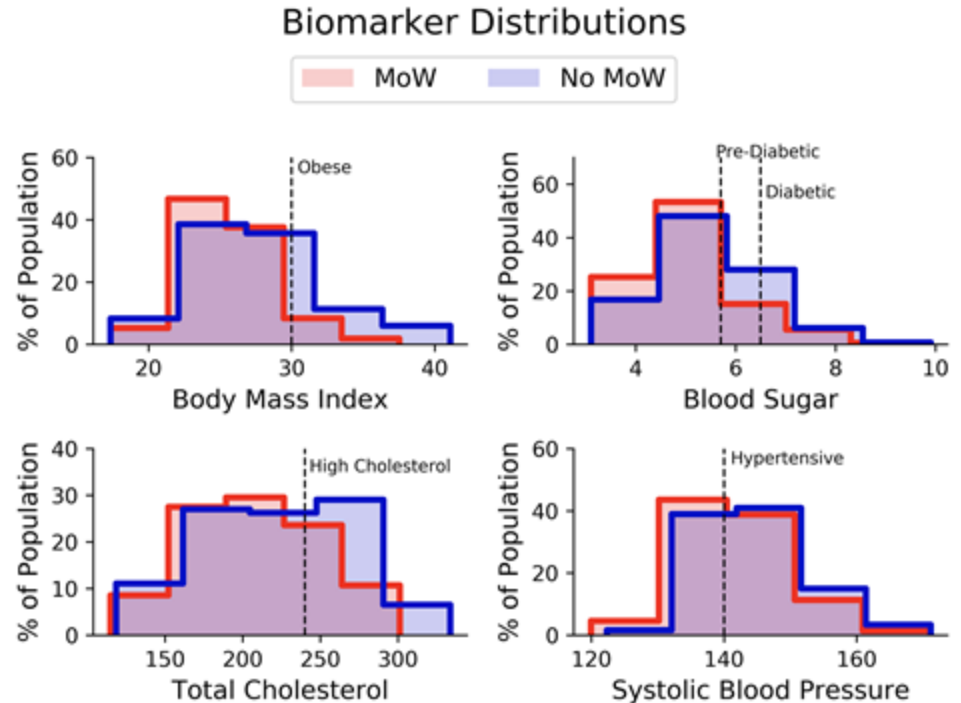
# A Shift in the Distributions to the Left Indicates MoW's Health Improvement

MoW positively impacts biomarkers which propagate health improvements across chronic conditions

- **Blood Sugar:** Reduction in uncontrolled diabetes
- **Blood Pressure:** Transition of people out of hypertension to normal/ pre-hypertensive

Most of malnutrition in Dallas is from sarcopenic obesity rather than being underweight, which reflected 98% of the 28% of the MoW malnourished population

There were fewer underweight individuals as compared to the US population





# Research Used to Model Impact of MoW on Loneliness & Falls

## MoW effect on Loneliness

- Interaction with MoW is predicted to lead to a 25% reduction in loneliness in the simulated population
  - 29% of seniors nationally are lonely<sup>1</sup>
  - 20% of MoW simulated population were found to be lonely, compared to 26% without MoW
- Reducing loneliness leads to a reduction in hospitalization events
  - 32% in risk of stroke<sup>2</sup>
  - 29% in risk of heart attack<sup>2</sup>
- Loneliness associated with 44% increased risk of future dementia<sup>3</sup>

## MoW effect on Falls

- MoW reduced the risk of falls of by 5%<sup>4</sup> for people receiving daily meals through
  - Reduction in frailty by reducing malnutrition<sup>4</sup>
  - Increased daily mobility required to meet MoW deliverer<sup>4</sup>



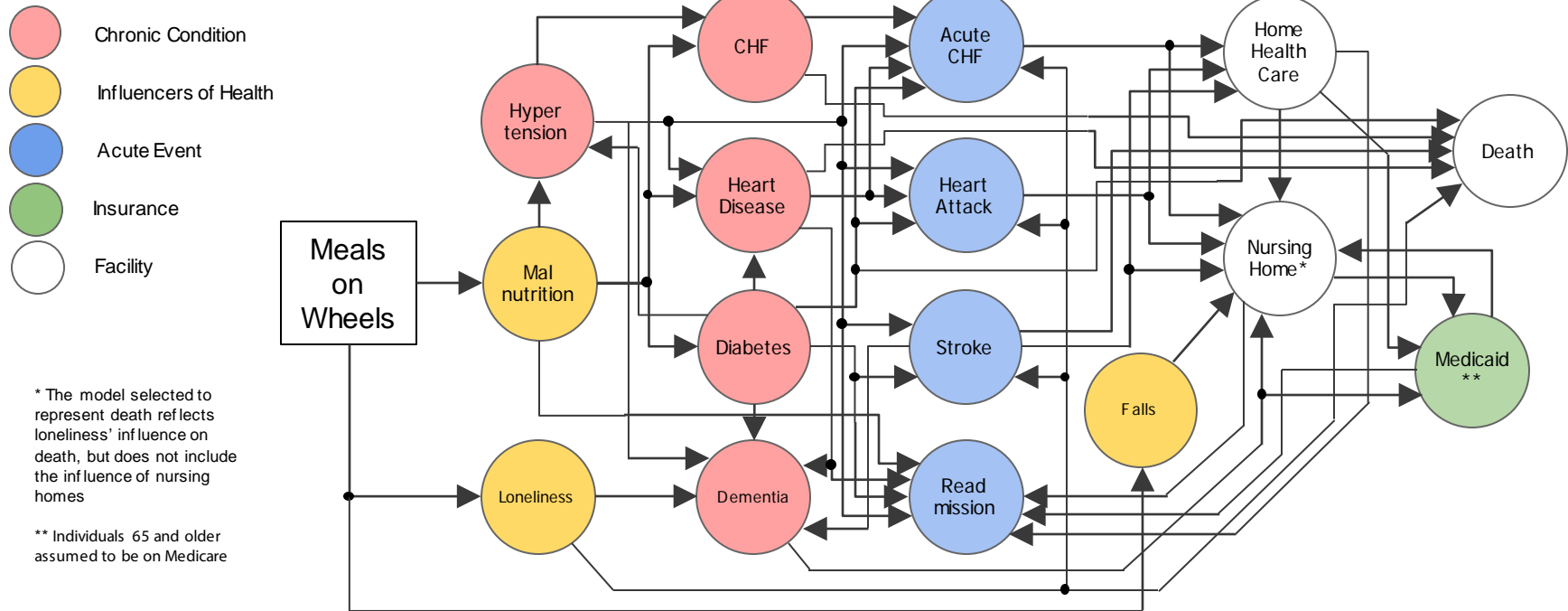
1. [http://www.aarp.org/research/topics/life/info-20-14/loneliness\\_20-10.html](http://www.aarp.org/research/topics/life/info-20-14/loneliness_20-10.html)

2. <https://www.ncbi.nlm.nih.gov/pubmed/27091846>

3. <https://www.ncbi.nlm.nih.gov/pubmed/28658937>

4. <https://www.ncbi.nlm.nih.gov/pubmed/27798291>

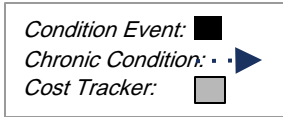
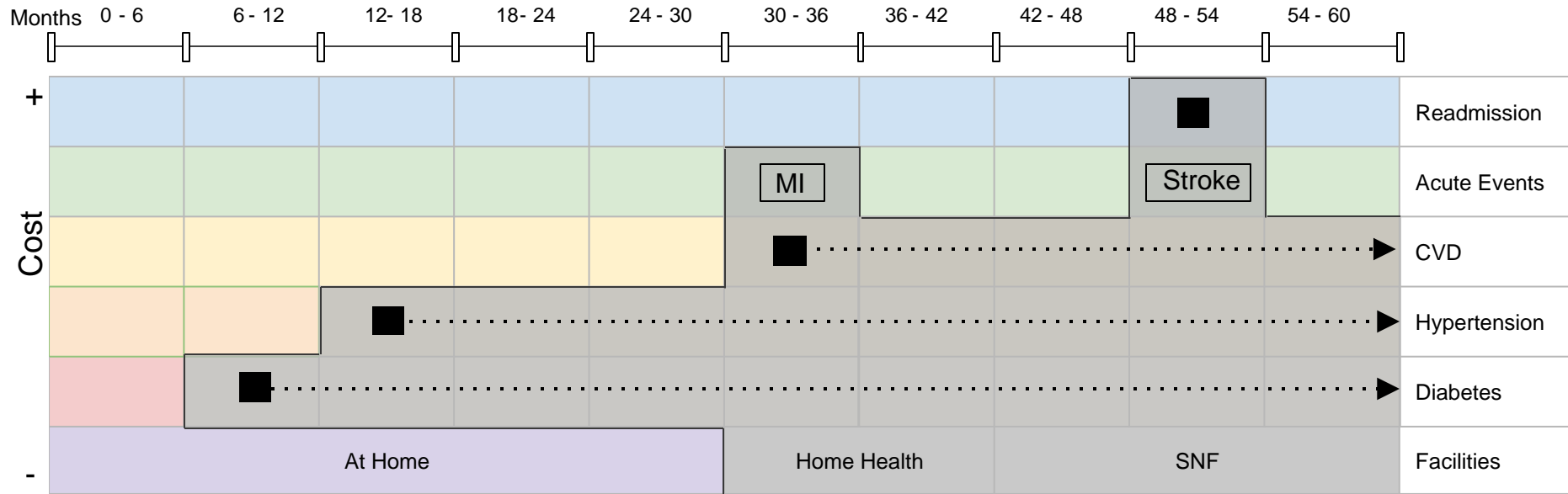
# Looking Under the Hood: The Domino Effect of MoW as Represented in the Inner-Workings of our Model



\* The model selected to represent death reflects loneliness' influence on death, but does not include the influence of nursing homes

\*\* Individuals 65 and older assumed to be on Medicare

# Illustration of How the Model Translates Health Outcomes to Costs for an Individual



# Impact of MOW on Chronic Conditions & Costs per Person

Chronic conditions were assessed based on model capabilities and research availability

Positive impact reflected across conditions with reductions in prevalence across the board

Key highlights include:

- **Hypertension:** reduction has wide influence on improving other health conditions
- **Congestive Heart Failure:** reduction leads to people remaining more active longer
- **Dementia:** MoW effect on loneliness has measurable influence on life changing and expensive condition; led to 25% cost reduction

| Chronic Conditions       | Prevalence at Baseline | Prevalence on MOW | Reduction in Costs /Person/Year |
|--------------------------|------------------------|-------------------|---------------------------------|
| Diabetes                 | 26.6%                  | 24.7%*            | \$102                           |
| Coronary Heart Disease   | 4.0%                   | 3.7%              | \$13                            |
| Angina                   | 2.1%                   | 2.0%              | \$20                            |
| Dementia                 | 13.8%                  | 12.0%             | \$552                           |
| Falls                    | 28.4%                  | 23.5%             | N/A**                           |
| Hypertension             | 64.0%                  | 52.9%             | \$77                            |
| Congestive Heart Failure | 7.4%                   | 6.1%              | \$84                            |
| Loneliness               | 26.6%                  | 20.0%             | N/A**                           |

\*Reduction in uncontrolled diabetes

\*\*Research costs directly associated with falls and loneliness couldn't be identified at a level to be included in the model

# Impact of MOW on Acute Events & Costs per Person

- Overall, MOW had a significant impact on reducing acute and expensive health events
- Hospitalizations can initiate a general downward spiral and decline in health
- Outside of what is modeled, there are secondary conditions associated with hospitalizations that are reduced by reduction in each of these acute events, such as sepsis & MRSA, recovery, and can lead to reduction in ADLs overall
- Hospital Readmissions impacts on hospital 30 - Day Readmission rate for ACOs and MCOs

| Acute Events                                  | Incidence at Baseline | Incidence on MOW | Reduction in Costs/Person /Year |
|---|-----------------------|------------------|---------------------------------|
| Stroke  | 1.9%                  | 1.7%             | \$109                           |
| Congestive Heart Failure with Hospitalization | 1.4%                  | 1.2%             | \$56                            |
| Heart Attack                                  | 3.3%                  | 2.8%             | \$96                            |
| Hospital Readmissions                         | 17.1%                 | 14.3%            | \$57                            |

# Impact of MOW on Facility Use, Costs per Person & Dual Eligibility

- Reduction in home health and SNF utilization accounted for 48% of the cost savings
- Loneliness impacted dementia and dementia along with reduced hospitalizations had a strong impact on SNF utilization
- Reduced SNF utilization results in longer time spent aging at home
- 3.6% reduction in dual eligible utilization
- Many factors influencing Home Health utilization were outside of model scope (e.g. how many ADLs can you perform, physical therapy, family moves away), Home Health is likely to decrease more than shown here

| Facilities  | Population Utilization at Baseline | Population Utilization on MOW | Cost Reduction / Person / Year |
|-------------|------------------------------------|-------------------------------|--------------------------------|
| Home Health | 19.2%                              | 19.0%                         | \$303                          |
| SNF         | 6.0%                               | 5.4%                          | \$750                          |

# Cost Impact of Two MOW Meals vs One Meal on the VNA's Population

The average health costs for a malnourished, at risk and healthy person are \$33,578, \$29,103 and \$27,899 respectively.

The annual cost savings per person is \$2,278 when serving two meals per person, an estimated \$60 more per year than serving one meal

- The small change in cost savings is attributed to the majority of malnourished people transitioning from malnourished to at-risk-of-malnourishment with the addition of one MOW meal to their diet
- One meal reduced malnourishment of the population by 82%<sup>1</sup>; only 1% of the population remained malnourished after two meals, leading to a lower change in estimated cost savings

| Nutritional Status of Population | Baseline Population | 1 MoW Meal | 2 MoW Meals |
|----------------------------------|---------------------|------------|-------------|
| Malnourished                     | 34%                 | 6%         | 1%          |
| At-risk-of-malnutrition          | 58%                 | 65%        | 47%         |
| Normal                           | 8%                  | 29%        | 52%         |

# Summary

- **With 48% ROI\* on the meal investment** and \$2,218 in health care cost savings VNA is making a significant impact in the health of its clients
- Key target areas for cost saving conversations include cardiovascular, dementia accounting, and home health and SNF utilization
- Loneliness had a 25% reduction in prevalence, the largest out of the measure categories
- More research should be done to assess the health impact of multiple meals on VNA's client population

\* 48% ROI assumes a \$6/meal cost

\*\*Conditions include: stroke, heart attack, congestive heart failure with and without hospitalization, coronary heart disease, hypertension



# MoW impact - Wireframe Storyboard

# Partnering to Increase the Impact of MoW

VNA would like to partner with hospitals and community organizations to increase its client base.

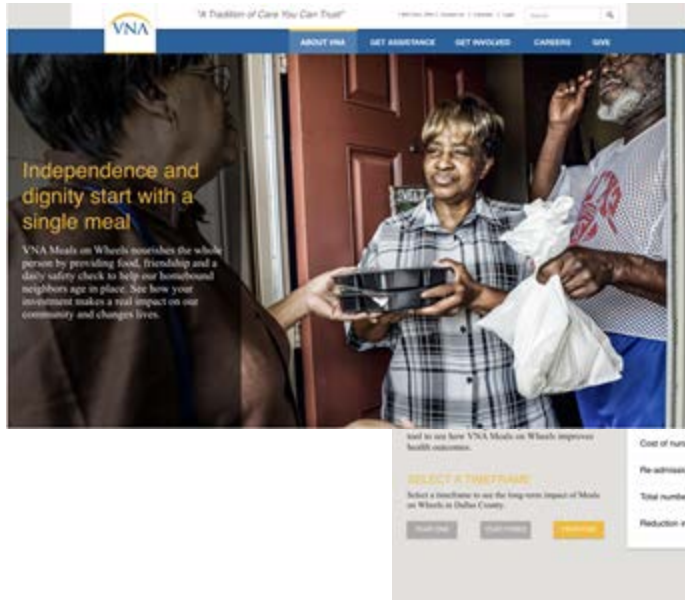
VNA has proposed impact goals, of which the wireframe can help display predictions for:

- Reduce 30-day readmission rate for participating patients by 10%

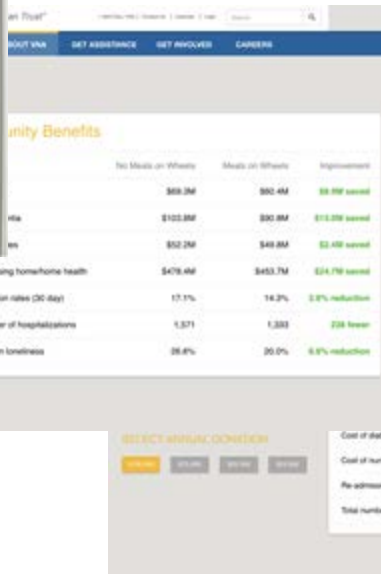


# Review of Wireframes

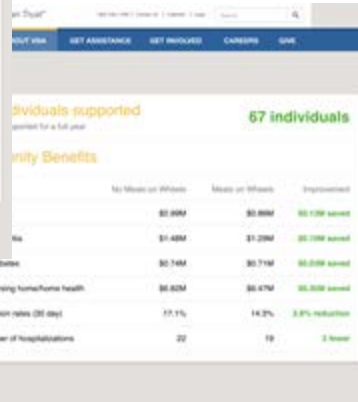
## Wireframes



Importance of a meal



VNA's impact



Your impact

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Thank you!

# Appendix

# Assumptions

## List out model caveats

- Home Health driven by Activities of Daily Life (ADLs), and Occupational & Physical Therapy, were not modeled
- Falls affects SNF admission but does not have an explicit cost
- Incomes were not individually modeled, all individuals were low-income
- Modeled reduction in malnutrition using macronutrient profile of MoW meals, but did not explicitly model MoW food consumed versus non-MoW food consumed
- People that die get replaced with twins to keep the population even
- Uncontrolled defined as diabetics with HbA1c >7.0
- Individuals 65 and older assumed to be on Medicare, individuals 60-65 assumed to be uninsured
- Hypoglycemia was not modeled, specific interaction of timing of drugs and diet at level of detail finer than modeled
- Malnourished persons are assumed to have a 27% higher cost of hospitalization

# Health Conditions & Costs

| Chronic Conditions         | Annual Cost             |
|----------------------------|-------------------------|
| Hypertension               | \$ 1,124 <sup>1</sup>   |
| Diabetes                   | \$8,760 <sup>2</sup>    |
| Congestive Heart Failure   | \$ 14,656 <sup>3</sup>  |
| Coronary Heart Disease     | \$7,918 <sup>4</sup>    |
| Angina                     | \$26,430 <sup>4</sup>   |
| Home Health                | \$43,476 <sup>5</sup>   |
| Dementia                   | \$ 61,207 <sup>6</sup>  |
| Skilled Nursing Fac. (SNF) | \$ 119,466 <sup>7</sup> |

## Key characteristics of cost data:

- Health condition costs include medical costs such as outpatient visits, office visits, and cost of medications
- Hospitalization costs are excluded from cost of health conditions
- Costs are for Medicare population (65+)
- Costs have been adjusted to account for inflation - 5.38% YoY

1. [https://meps.ahrq.gov/data\\_files/publications/st404/stat404.shtml](https://meps.ahrq.gov/data_files/publications/st404/stat404.shtml)

2. <https://www.ncbi.nlm.nih.gov/pubmed/23468086>

3. <https://www.ncbi.nlm.nih.gov/pubmed/24945038>

4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4105734/>

5. <https://www.genworth.com/about-us/industry-expertise/cost-of-care.html>

6. <http://www.nejm.org/doi/full/10.1056/NEJMsa1204629#t=article>

7. <https://www.metlife.com/assets/cao/mmi/publications/studies/2011/mmi-market-survey-nursing-home-assisted-living-adult-day-services-costs.pdf>

# HOSPITALIZATION EVENTS AND COSTS

| Acute Events             | Cost per Hospitalization |
|--------------------------|--------------------------|
| Heart Attack             | \$ 13,004 <sup>1</sup>   |
| Congestive Heart Failure | \$ 14,298 <sup>2</sup>   |
| Re-admission             | \$ 17,019 <sup>3</sup>   |
| Stroke                   | \$ 28,676 <sup>4</sup>   |

## Key characteristics of cost data:

- Cost per hospitalization includes average cost inpatient hospitalization for the underlying health conditions
- Costs are for Medicare population over 65
- The cost of hospitalization is based on national average costs per episode of care
- Costs have been adjusted to account for inflation - 5.38% YoY<sup>5</sup>

1. [http://www.ajmc.com/journals/issue/2010/2010-03-vol16-no3/ajmc\\_10marnicholswebx\\_e86to93](http://www.ajmc.com/journals/issue/2010/2010-03-vol16-no3/ajmc_10marnicholswebx_e86to93)

2. <https://www.ncbi.nlm.nih.gov/pubmed/24945038>

3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3593602/>

4. <https://www.ncbi.nlm.nih.gov/pubmed/22198978>

5. [https://ycharts.com/indicators/us\\_health\\_care\\_inflation\\_rate](https://ycharts.com/indicators/us_health_care_inflation_rate)



# Health State Model References

- MoW effect on Malnutrition: <https://www.ncbi.nlm.nih.gov/pubmed/26106989>, <https://www.ncbi.nlm.nih.gov/pubmed/20711924>, <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb218-Malnutrition-Readmissions-2013.pdf>
- MoW effect on Loneliness: <https://www.ncbi.nlm.nih.gov/pubmed/26613620>, [http://www.aarp.org/research/topics/life/info-2014/loneliness\\_2010.html](http://www.aarp.org/research/topics/life/info-2014/loneliness_2010.html), <https://www.ncbi.nlm.nih.gov/pubmed/27091846>
- MoW effect on Falls: <https://www.ncbi.nlm.nih.gov/pubmed/27798291>
- Hypertension: Directly from Bodylogical model
- Diabetes: Directly from Bodylogical model, <https://www.ncbi.nlm.nih.gov/pubmed/26953170>
- CHD and Angina: <http://circ.ahajournals.org/content/97/18/1837.full>, <http://circ.ahajournals.org/content/117/4/e25.long>
- Congestive Heart Failure: <http://jaha.ahajournals.org/content/6/5/e005231#DC1>
- Dementia: <https://www.ncbi.nlm.nih.gov/pubmed/28658937>
- Myocardial Infarction: <https://www.ncbi.nlm.nih.gov/pubmed/10650300>
- Stroke: <http://circ.ahajournals.org/content/135/12/1145>
- Acute CHF: <http://jaha.ahajournals.org/content/6/5/e005231#DC1>
- Readmission: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2566906/>
- Nursing Home: <https://www.ncbi.nlm.nih.gov/pubmed/17578574>
- Home Health: <https://www.cdc.gov/nchs/data/nhsr/nhsr052.pdf>
- Death: <https://www.ncbi.nlm.nih.gov/pubmed/9290512>