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Evaluation of the Jefferson Family Medicine Associates' Diabetes Information and Support for Your Health (DISH) Program [presentation]

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Presentation Outline

- Background
  - Type 2 Diabetes
  - Type 2 Diabetes Self-Management Education and Group Medical Visits
  - DISH Program
- Study Overview and Aims
- Methods
- Results
- Discussion

Background

Type 2 Diabetes Background

- 90-95 percent of all diabetes cases
- Metabolic disorder from insulin resistance and beta-cell dysfunction
- Diagnosis: HbA1c ≥ 6.5% or FPG ≥ 126 mg/dL

National Institute of Diabetes and Digestive and Kidney Diseases (2014). Diabetes diagnosis. Retrieved from http://diabetes.niddk.nih.gov/dm/pubs/diagnosis/index.aspx

Significance

- Major population health concern:
  - 14.2% of American adults (17.6% in Philadelphia)
  - Prevalence tripled since 1980
  - Morbidity and Mortality
    - Microvascular: retinopathy, neuropathy, nephropathy
    - Macrovascular: coronary artery disease, stroke
    - 7th leading cause of death
  - Quality of life impact
  - Costs
  - Disparities in prevalence and outcomes

American Diabetes Association (2013). Standards of medical care in diabetes—2013. Diabetes Care. 36(Supplement 1), 36:S11-S66.
Centers for Disease Control and Prevention (2014). National diabetes statistics report 2014. Retrieved from http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf

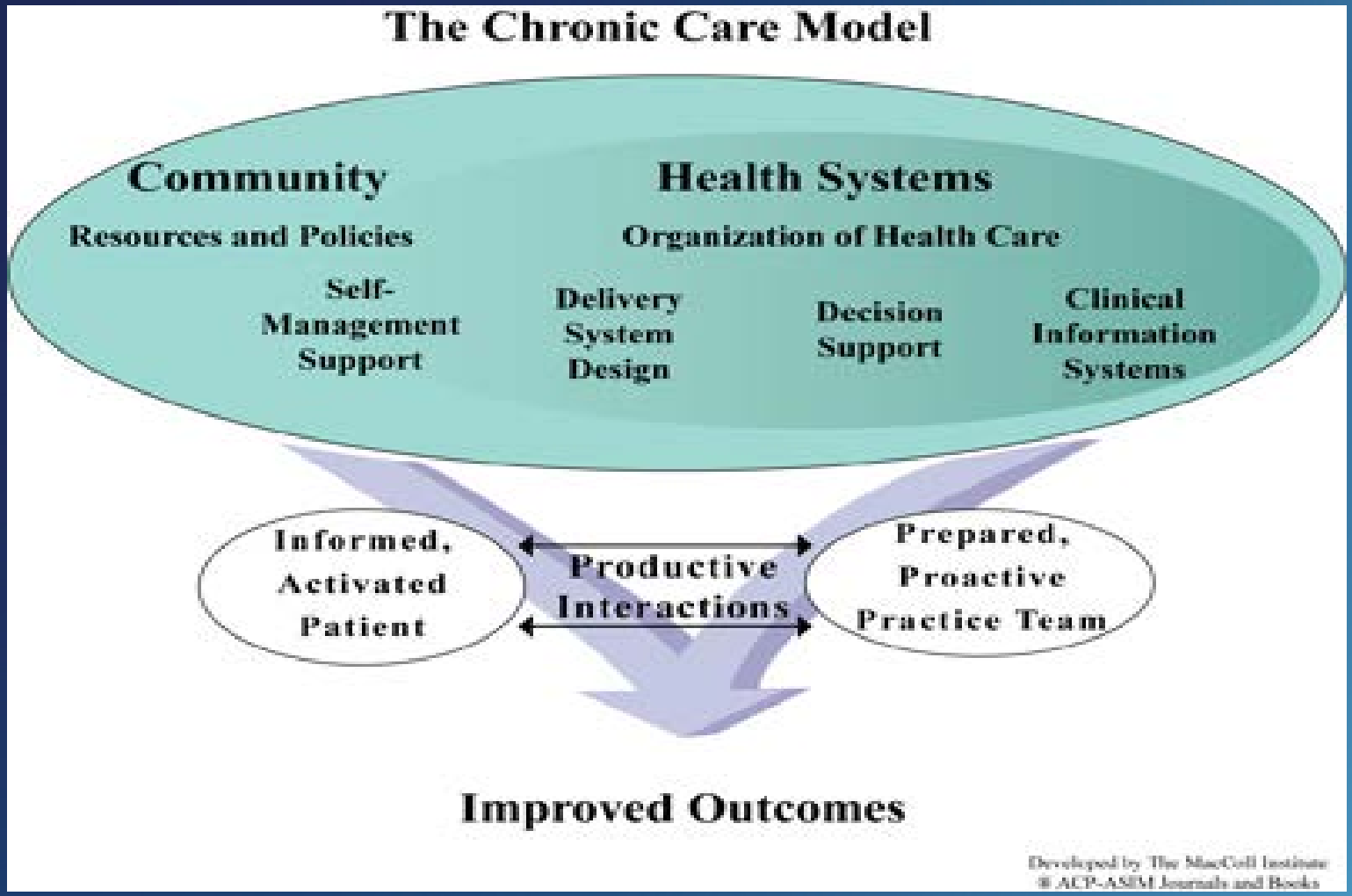
Clinical Guidelines

- Selected findings from review of 29 guidelines:
  - Control/monitoring of HbA1c, blood pressure, cholesterol
  - Medications
  - Preventive screenings and vaccinations
  - Lifestyle management: nutrition, physical activity, weight loss
  - Self-management education

AADE7 Self-Care Behaviors

- Healthy eating
- Being active
- Monitoring
- Taking medications
- Problem solving
- Healthy coping
- Reducing risks

Only 56.8% of adults with diabetes have received formal self-management education



Improving Chronic Illness Care (2014). The Chronic Care Model. Retrieved from http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2

Type 2 Diabetes Self-Management Education (DSME)

- Often group education—settings vary
- Addresses patients' concerns and challenges in daily management (AADE7 Self-Care Behaviors)
- Stanford Chronic Disease Self-Management Program Model
  - Problem solving
  - Action planning—set concrete, short-term behavior change goals, develop plan to address challenges and meet goals

DSME and Self-Efficacy

- DSME has shown improvements in knowledge, attitudes, self-management behaviors, clinical outcomes
- What drives these changes?
- Self-efficacy: the confidence that one can achieve a certain behavior or psychological state under specific circumstances

Norris, S. L., Engelgau, M. M., & Narayan, K. V. (2001). Effectiveness of self-management training in type 2 diabetes a systematic review of randomized controlled trials. Diabetes Care, 24(3), 561-587.

Diabetes Group Medical Visits

- Diabetes GMV literature review: 31 studies, three systematic reviews
  - Improvements in knowledge, self-efficacy, self-care behaviors, quality of life
  - Some improvements in clinical, process of care and utilization measures

Diabetes GMV Literature Review

HbA1c	• Lowered HbA1c (.46%-1.44%)
Systolic blood pressure	• Lowered SBP (5-5.2 mmHg)
Cholesterol	• Mixed findings
Weight/BMI	• Mixed findings
Processes of care	• Improved microalbuminuria and retinopathy screening rates
Utilization	• Mixed impact on primary care • Reduced ED visits • Mixed impact on admissions

Diabetes GMV Literature: Strengths and Weaknesses

- A number of RCTs
- Three systematic reviews
- Consistency in which clinical outcomes measured

- Theoretical basis
- Lack of detail on curriculum
- Differences in how outcomes were measured
- Representativeness of enrollees?
- Attrition?

Gaps in the Diabetes GMV Literature

Little research on:

- Diabetes GMVs in African-American populations
- “Real-world” diabetes GMV programs
- EMR-derived GMV data
- Differences between participants and nonparticipants
- Long-term clinical outcomes
- Process measures
- Utilization measures

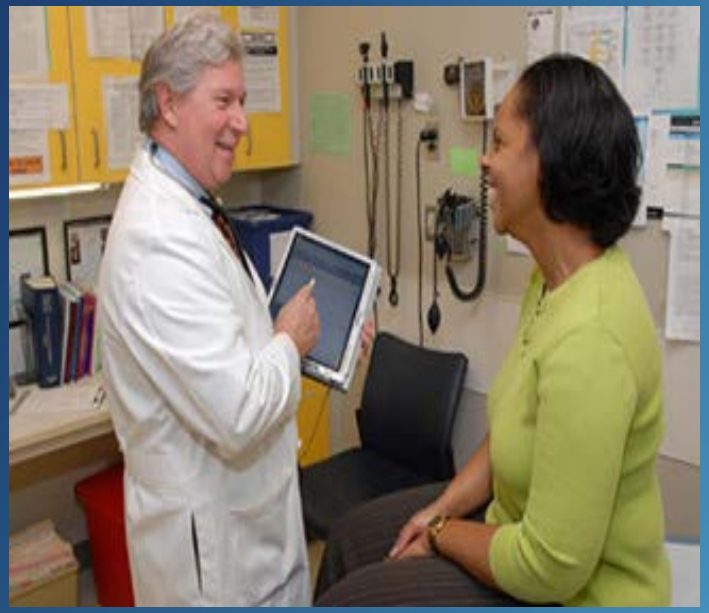
Study Overview and Aims

Study Overview

Evaluation of the impact of Jefferson Family Medicine Associates' (JFMA's) Diabetes Information and Support for your Health (DISH) GMV program on longitudinal clinical, process of care, and utilization outcomes

Jefferson Family Medicine Associates (JFMA)

- Affiliated with Thomas Jefferson University's Department of Family and Community Medicine



- 36,000 patients making > 80,000 visits a year
  - 64% female
  - 50.5 % African American, 35.8 % Caucasian, 1.7% Hispanic, and 7.7% Asian.

- DISH: Diabetes GMV offered since 2009 (via physician referral)
- 4-session Friday AM

One-on-One Provider Visits

- Initial DISH visit
  - Patient's medical history
  - Risk factors
  - Dates of preventive services
  - Current challenges
  - Schedule follow-up visits and lab tests
  - Develop action plan

- Follow-up visits
  - Outcomes from previous DISH session
  - Develop an action plan

Group DSME

- Based on AADE7 Self-Care Behaviors, Stanford model
- DISH Curriculum
  - Session 1
    - Diabetes overview
    - Monitoring, problem-solving, being active
  - Session 2: Healthy Eating
  - Session 3: Reducing Risks, Avoiding Complications and Taking Medications
  - Session 4: Healthy Coping
- Each session includes individual action planning

Previous DISH Studies

- Two qualitative medical student/resident projects
- MPH capstone projects: Impact on clinical outcomes among original 52 DISH participants from 2009
- Some positive findings but had limitations

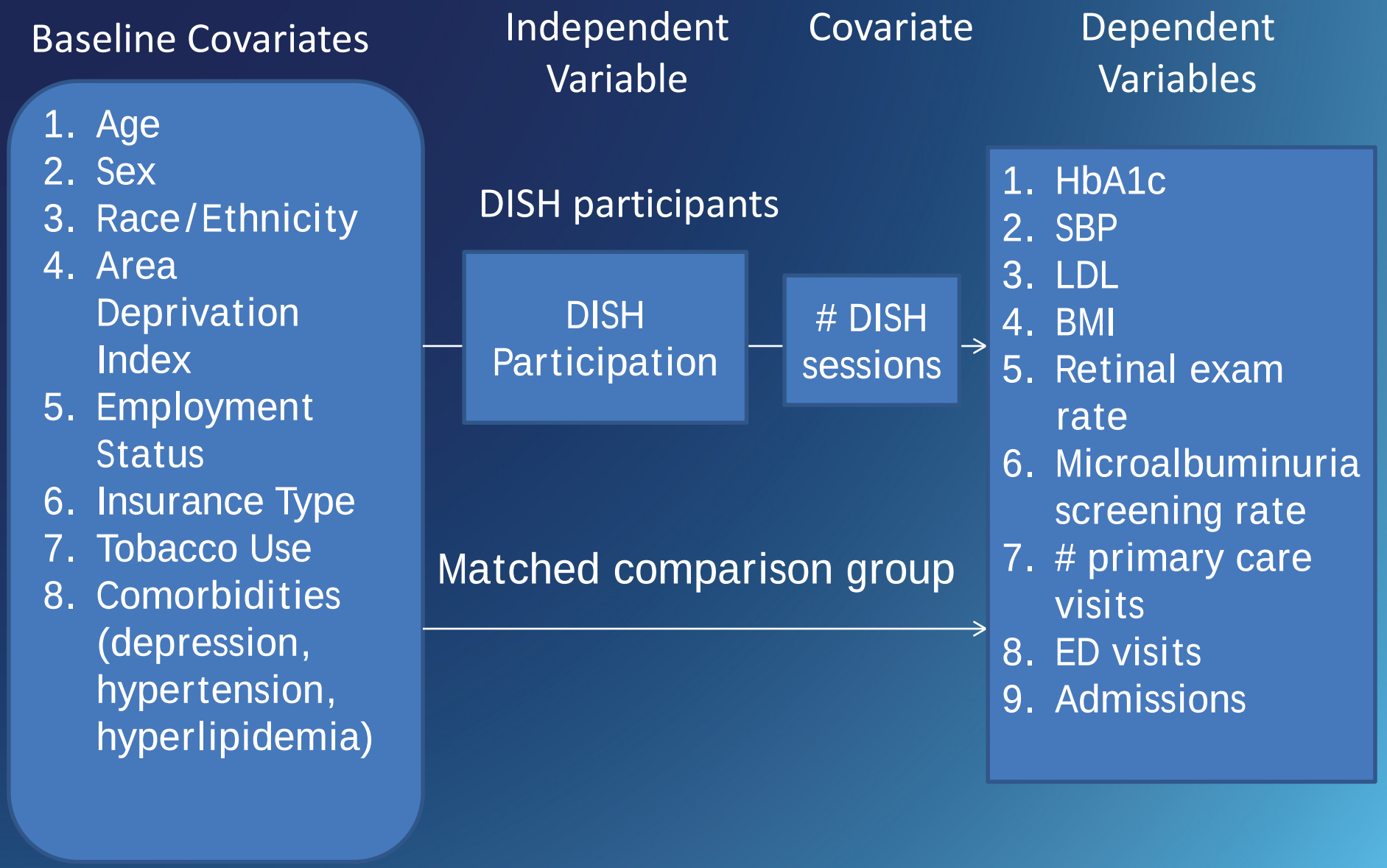
Research Aims

1. Descriptively compare the DISH participants with JFMA patients with type 2 diabetes who had not attended DISH; use propensity score matching to create a matched comparison group of non-DISH participants.

2. Assess the impact of DISH participation, including number of DISH sessions attended, on HbA1c, SBP, LDL-C, and BMI mean change and change trajectories.
   2A: One-year HbA1c, SBP, LDL-C, BMI
   2B: Five-year HbA1c

3. Assess the impact of DISH participation, including number of DISH sessions attended, on processes of care and utilization measures.
   3A: Retinal exams and microalbuminuria screening
   3B: Primary care visits, ED visits, hospital admissions

Conceptual Model



Methods

Methods: Study Design

- Retrospective: July 2009-February 2015
- Quasi-experimental non-equivalent groups design
  - Participation in intervention and control groups not due to random assignment
  - Stronger than single-group pre-test post-test

Methods: Study Population and Data

- Patient at Jefferson Family Medicine Associates from July 2009-February 2015
- 18 years of age or older
- Had at least one visit during the study period
- Diagnosed with type 2 diabetes, as determined by ICD-9 codes
- "DISH participant" if had one or more DISH visits as noted by "FAM MED, DOCTOR GROUP" provider code

- Data extracted from Allscripts (JFMA EMR) and JeffChart (Jefferson ED visits and admissions); approved by TJU IRB as expedited study

Aim 1 Methods

Hypothesis 1: DISH participants and non-DISH participants will differ significantly in the baseline covariate of employment status.

Statistical Methods:

1. Frequencies, descriptive statistics, chi-square tests to compare DISH participants and unmatched participant group
2. 1:1 nearest-neighbor propensity score matching to create matched comparison group
3. Chi-square, t-tests, descriptive statistics to evaluate matching

Propensity Score Matching

Purpose: To create matched comparison group to strengthen causal inference in observational study

- Matching criteria
  - Determined through theory, literature
  - Related to treatment assignment and/or outcome, but **not changed** by treatment participation
    - Age category, Sex, Race/ethnicity
    - Area Deprivation Index quintile
    - Year of initial visit recorded in EMR

- Propensity score: Value (0-1) indicating probability of being in the treatment group given covariates
- 1:1 nearest neighbor matching without replacement

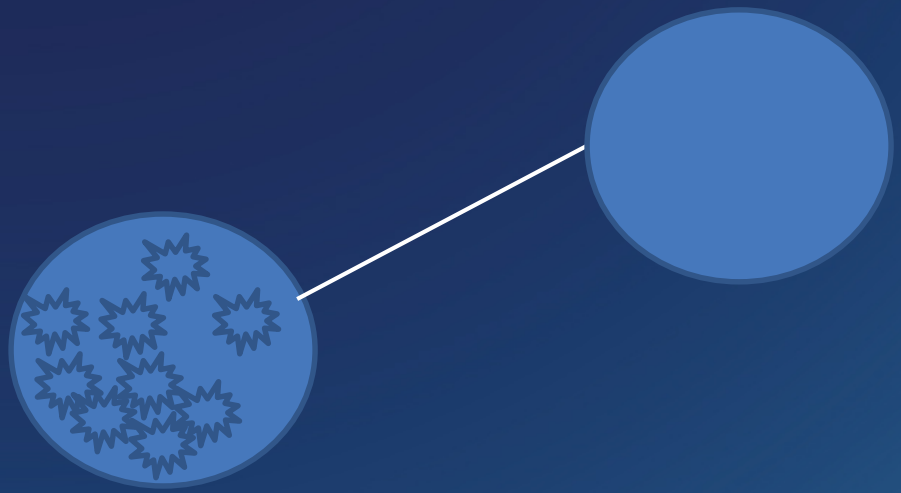
Aim 2A Methods

Hypothesis 2A: DISH participants will exhibit and maintain a significant mean reduction and rate of improvement in one-year HbA1c, SBP, LDL-C, and BMI change trajectories compared to matched comparison group, with attendance at a greater number of DISH sessions predicting larger mean reductions and greater rates of improvement.

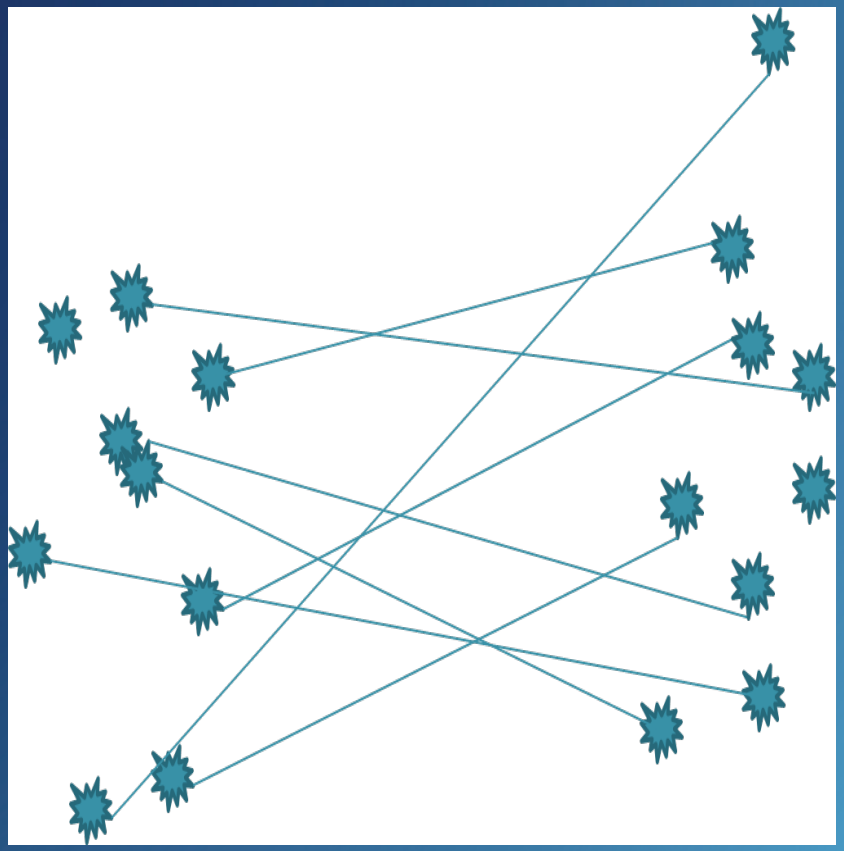
Statistical Methods:

1. Paired-samples t-tests for within-group change; independent-samples t-tests for between-group change
2. Linear regression
3. Hierarchical linear modeling

- Average Change



- Individual Change



Hierarchical Linear Modeling (HLM)

- Captures both individual and group change over time
  - Nested data (patients within DISH/no-DISH)
  - Flexible with missing data, differing data collection times for repeated measures

- Two-level models
  - Null-level: Intercept-only
  - Level 1: Individual-level variation
  - Level 2: Group-level variation (DISH participation, sex, race, age at index date, and number of DISH visits)

Aim 2B Methods

Hypothesis 2B: The sub-group of initial DISH participants will exhibit and maintain a significant mean reduction in five-year HbA1c compared to matched comparison group, with attendance at a greater number of DISH sessions predicting larger mean reduction.

Statistical Methods:

1. Paired-samples t-test
2. Linear regression

Aim 3A Methods

Hypothesis 3A: At one year post-DISH participation, DISH participants will have significantly higher rates of retinal exams and microalbuminuria screening than the matched comparison group, with attendance at a greater number of DISH sessions predicting greater improvements in screening rates.

Statistical Methods:

1. McNemar's Test for Correlated Proportions
2. Logistic regression

Aim 3B Methods

Hypothesis 3B:At one year post-DISH participation, DISH participants will have a higher mean number of primary care visits and a lower proportion of emergency department visits and hospital admissions than the matched comparison group, with attendance at a greater number of DISH sessions predicting a greater number of primary care visits and lower proportion of emergency department visits and hospital admissions.

Statistical Methods:

1. Wilcoxan signed-rank test (primary care)
2. Linear regression (primary care)
3. McNemar's Test for Correlated Proportions (ED, admissions)
4. Logistic regression (ED, admissions)

Results

Aim 1 Results: Descriptive Comparison and Matching

Hypothesis 1 was not supported

- DISH participants (n=233) and the unmatched comparison group (n=1269) did not significantly differ in employment status (*p*=.97).

- Participants were
  - Younger
  - More likely to be African-American
  - More likely to be female
  - Had higher Area Deprivation Index
  - More likely to have depression and hyperlipidemia

Aim 1 Results: Propensity Score Matching

230/233 DISH participants matched (98.7%)

Final sample for Aims 2 and 3: 230 DISH participants, 230 matched comparison group members

No significant differences between DISH and matched comparison group except diagnosis of hyperlipidemia (p=.012)

Aim 2A Results: DISH participation

- Mean number of sessions attended in index year: **2.21**(3.81)

- Median: **1**
- Most common number attended: **1** (63.5% of participants)

- Only **9**(3.9%) attended four sessions

- **17** participants attended 5 or more
- Maximum number: **38** sessions in one year

Aim 2A Results: HbA1c

Hypothesis 2A was not supported

- HLM model: quadratic (DISH participants had initial increase in HbA1c, then decline)
- DISH participation/ number of DISH visits not significant predictors of HbA1c decline

Mean HbA1c at each time period

Time Period	DISH Participants Mean(SD)	Matched Comparison Group Mean(SD)
0	9.37(2.37)	8.24 (2.11)
1	9.91 (2.51)	8.35 (2.03)
2	9.90 (2.28)	8.58 (2.25)
3	9.20 (2.15)	8.59 (2.49)
4	8.94 (2.09)	8.45 (2.31)

Aim 2A Results: SBP

Hypothesis 2A was not supported

- HLM model: intercept only (groups differed significantly at baseline, but no significant individual/group change)
- DISH participation/ number of DISH visits not significant predictors of SBP decline

Mean SBP at each time period

Time Period	DISH Participants Mean(SD)	Matched Comparison Group Mean(SD)
0	133.23(15.14)	135.04(16.13)
1	133.83(15.16)	135.61(21.44)
2	133.33(19.71)	135.27(19.46)
3	134.66(16.08)	137.05(19.54)
4	132.69(17.06)	133.15(17.56)

Aim 2A Results: LDL

Hypothesis 2A was not supported

- HLM model: simple linear model with negative slope (-2.58 mg/dL per time period)
- DISH participation/number of DISH visits not significant predictors of LDL decline

Mean LDL at each time period

Time Period	DISH Participants Mean(SD)	Matched Comparison Group Mean(SD)
0	117.84(44.92)	109.45(49.58)
1	100.34(44.76)	102.17(36.72)
2	99.36(37.01)	110.91(37.89)
3	104.30(39.29)	100.86(42.94)
4	108.37(39.78)	99.00(27.51)

Aim 2A Results: BMI

Hypothesis 2A was not supported

- HLM model: intercept only (groups differed significantly at baseline, but no significant individual/group change)
- DISH participation / number of DISH visits not significant predictors of BMI decline

Mean BMI at each time period

Time Period	DISH Participants Mean(SD)	Matched Comparison Group Mean(SD)
0	35.33(7.64)	34.56(6.93)
1	34.84(7.78)	35.31(7.25)
2	35.41(8.11)	34.61(6.98)
3	35.09(7.16)	34.45(6.26)
4	35.54(7.55)	34.40(6.59)

Aim 2B Results: 5-Year HbA1c

Hypothesis 2B was not supported

- Initial DISH participants did not have a significant reduction in five-year HbA1c compared to matched comparison group
- Number of DISH sessions attended not significant predictor
- Data availability: 18 DISH participants had data available in years 1 and 5; 12 in matched comparison group

Year 1 & 5 HbA1c

Time Period	DISH Participants M(SD)	Matched Comparison Group M(SD)
Year 1	9.03(2.37)	8.83(2.21)
Year 5	8.45(1.80)	9.04(1.51)

Aim 3A Results: Retinal Exam Screening

- Retinal exam EMR data extraction, based on the retinal exam CPT code, yielded a small number of retinal exams from 2011-2012.
- Conversations with data analytics, JFMA providers cast doubt on the validity of the data.
- Therefore, this portion of Aim 3A was **not completed.**

Aim 3A Results: Microalbuminuria Screening

Hypothesis 3A was not supported

- DISH participants did not have improved microalbuminuria screening rates post-DISH
- DISH participation / number of DISH visits not significant predictors of screening

Microalbuminuria Screening Rates

Time Period	DISH Participants	Matched Comparison Group
One Year Pre-DISH	87.0%	58.7%
One Year Post-DISH	75.7%	60.4%

Aim 3B: Results: Primary Care Visits

Hypothesis 3B was partially supported

- DISH participation and number of DISH visits *were* significant predictors of number of PCP visits ($p<.001$)

Median PCP Visits Pre- and Post-DISH

Time Period	DISH participants Median	Matched comparison group Median
One Year Pre-DISH	5	2
One Year Post-DISH	4	2

Aim 3B Results: ED Visits and Admissions

Hypothesis 3B was not supported

- DISH participants did not have a lower proportion of emergency department visits and hospital admissions than matched comparison group post-DISH
- DISH participation / number of DISH visits not significant predictors

Proportion with ED Visit/Admission Pre- and Post DISH

ED Visits Time Period	DISH participants	Matched comparison group
One Year Pre-DISH	35.2%	30.0%
One Year Post-DISH	33.5%	23.5%

Admissions Time Period	DISH participants	Matched comparison group
One Year Pre-DISH	14.8%	11.7%
One Year Post-DISH	10.9%	7.0%

Discussion

Aim 1 Discussion

- Hypothesis 1 not supported; two groups did not differ significantly in employment status
  - Employment variable limitations
- Significant differences between participants and non-participants
    - Age, Sex, Race
    - Area Deprivation Index (marginally significant)
    - Depression and hyperlipidemia
- Successful propensity score matching—can be used in future studies

Aim 2 Discussion

- HbA1c
  - One-year HbA1c: Finding different than literature, prior DISH studies
  - Five-year HbA1c: different from one study examining this outcome
- SBP
  - Finding different than literature, prior DISH studies
- LDL, BMI
  - Literature was mixed

Aim 3 Discussion

- Retinal exam data
  - Quality of EMR data
- Microalbuminuria screening
  - Results differed from literature
- Primary care visits, ED visits, Admissions
  - Literature mixed

DISH Attendance and Implementation Challenges

- DISH “dose” not a significant predictor of outcomes
  - Most participants had only one visit
  - Highly-skewed distribution—”frequent flyers”

- Program implementation challenges
  - Large, busy practice
  - Lack of referral tracking, reminders
  - Changing clinicians in sessions
  - Participant self-efficacy, attitudes unknown
  - Patient logistical barriers

Contributions

- Evaluation of diabetes GMV in predominantly African-American population
- Evaluation of established group visit program in a primary care practice
- EMR data
- Comparison of participants and non-participants
- Group visits' impact on HbA1c, SBP, LDL-C, and BMI change trajectories, and five-year HbA1c change
- Group visits' impact on processes of care and utilization

Limitations

- Retrospective data
- Nonrandomized design
  - Selection bias
  - Invisible differences
- Process and intermediate outcome measures only; no patient-reported outcomes
- Missing data points
- EMR data limited, not always easily extractable
- ED/admissions data limited to Jefferson and Methodist
- Ecological fallacy (Area Deprivation Index)
- Threats to external validity

Implementation Recommendations

- More systematic referral process
- Referral tracking/patient registry
- Reminders
- Solicit patient feedback regarding program (time, length, format)
- Standardize learner (residents, med students, etc.) preparation

Future Studies

- Qualitative studies of “super users,” positive deviants
- Impact on participants with pre-diabetes
- Survey/interviews with non-completers to understand barriers to completion
  - Implement reminder calls, other efforts to increase participation
  - Track referrals to DISH vs. who attends
- Measure pre-post self-efficacy
- Evaluate as interprofessional teaching tool

Ideal Future Study

- Pragmatic Trial
  - Prospective, randomized controlled design
  - Participants reflective of general patient population
  - Intervention that's sustainable in practice
  - Measure broader range of outcomes, including changes in self-efficacy, patient experience, costs
  - RE-AIM

Policy Recommendations

- Fund research on diabetes group medical visits
  - Optimal format and content
  - Pragmatic trials
  - Cost and ROI
    - Practice
    - Patient
- Group visit billing codes
- Encourage EMR uptake, including measures of social determinants

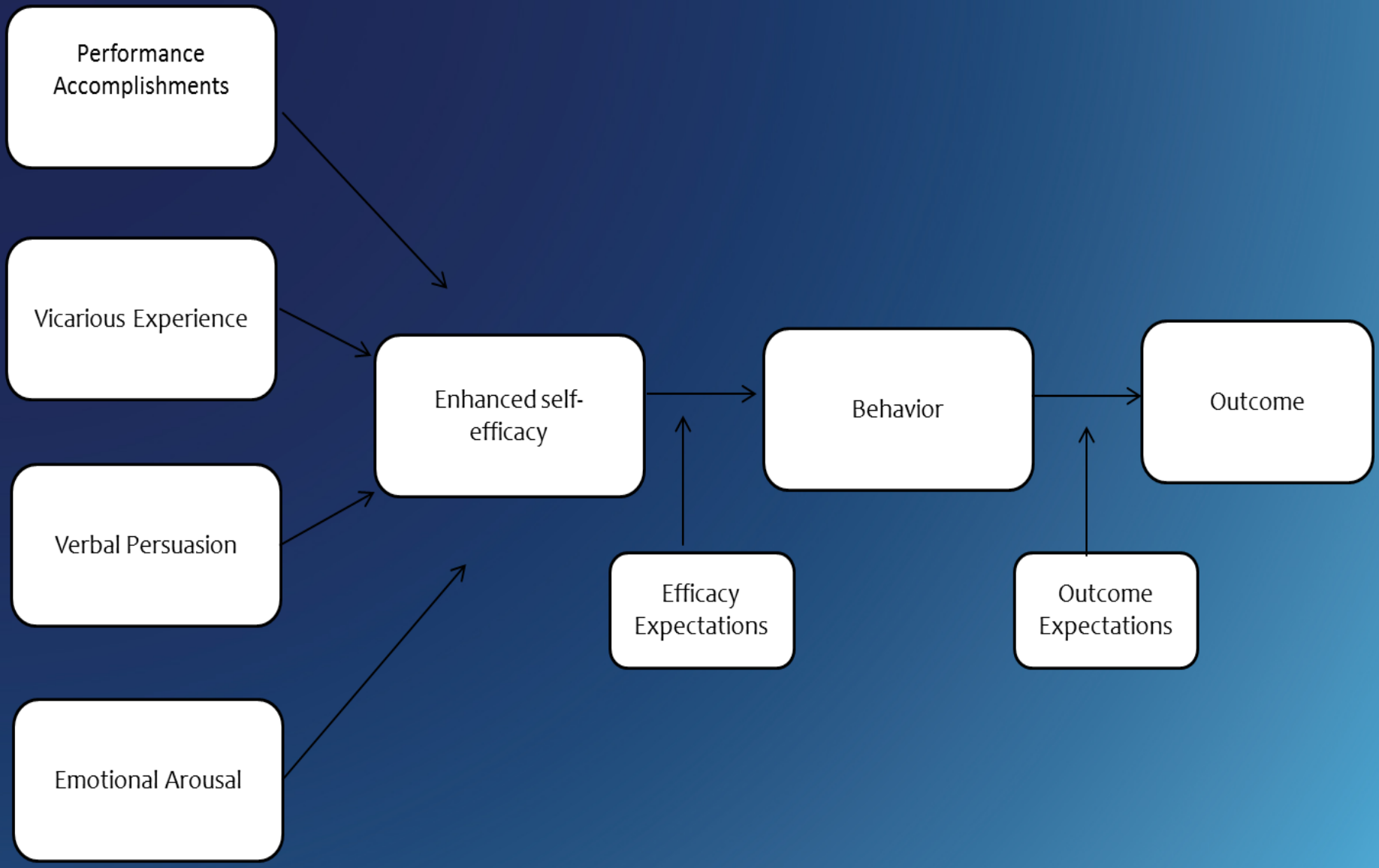
Conclusions

- Diabetes is an increasingly concerning population health issue, particularly among African-Americans.
- Many individuals with type 2 diabetes face self-management challenges, lack access to self-management education.
- Group medical visits combine one-on-one clinician visits with group diabetes self-management education.
- The DISH diabetes group medical visit program did not significantly affect clinical, process of care, or utilization measures. Attrition and EMR data quality were possible influences.
- Number of avenues for program implementation, research, and policy.

Questions

Appendix

Self-Efficacy Theory



Adapted from Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

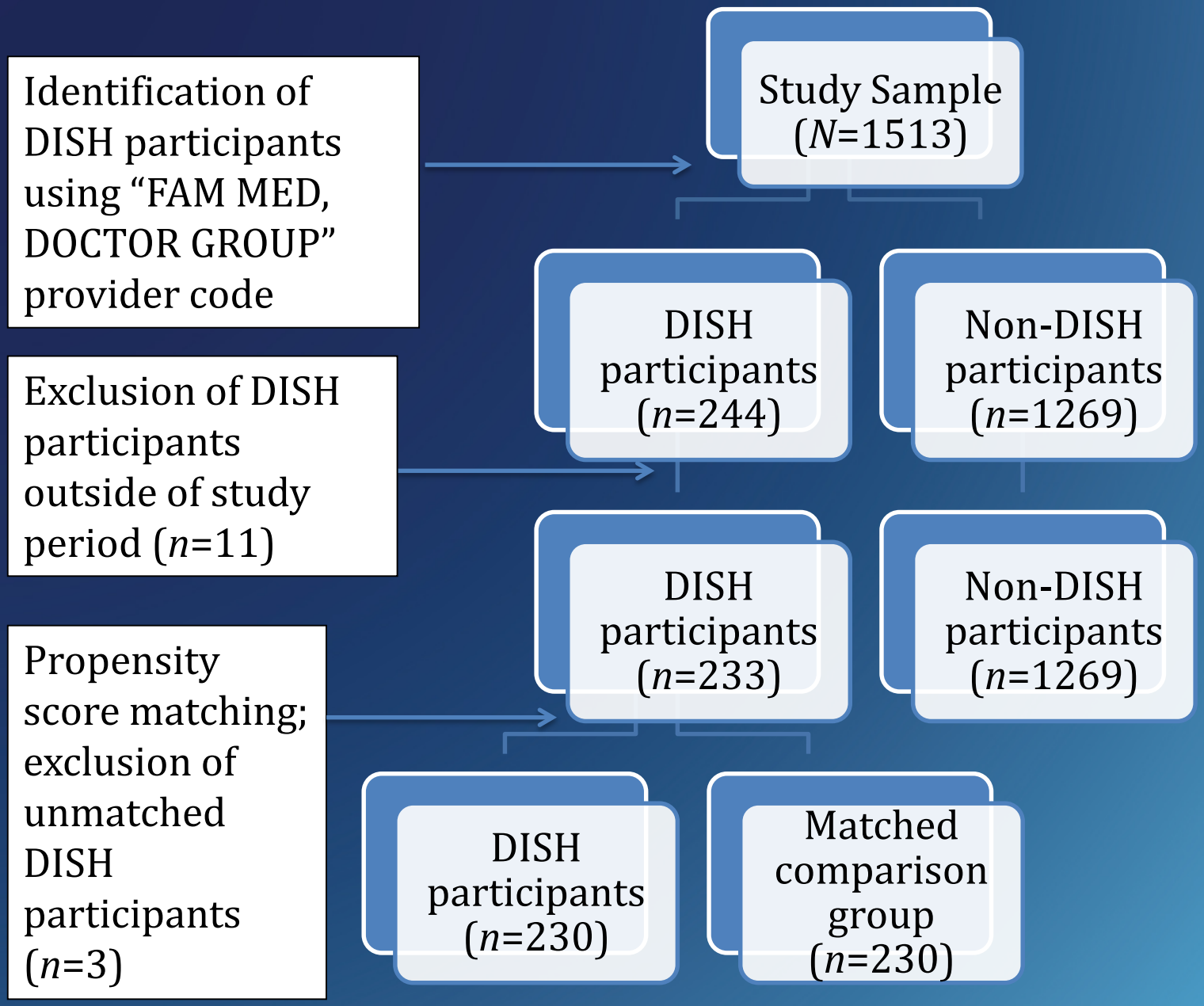
Descriptive Variables

Characteristic (%)	DISH Participants (n = 233)	Unmatched Non-DISH Participants (n =1269)	Chi-square (X^2)	*p*-value
Age Category			23.87	<.001
18-44	7.0	13.2		
45-54	28.7	21.9		
55-64	37.0	31.0		
65-74	21.3	19.0		
75 and older	6.1	14.9		
Race			35.39	<.001
African American	87.0	67.5		
White	8.3	19.5		
Other	4.8	13.0		
Sex			12.79	<.001
Female	69.1	56.5		
Male	30.9	43.5		

Characteristic (%)	DISH Participants (n = 233)	Unmatched Non-DISH Participants (n =1269)	Chi-square (X^2)	*p*-value
Area Deprivation Index (ADI) Quintile			13.99	.07
0-20	14.8	26.1		
21-40	21.7	18.4		
41-60	19.6	18.5		
61-80	21.7	18.9		
81-100	22.2	18.0		
Insurance provider			1.65	.44
Public	81.0	81.7		
Private	17.7	17.7		
Self-pay	0.0	0.7		
Employed	55.0	55.2	.001	.97

Characteristic (%)	DISH Participants (n = 233)	Unmatched Non-DISH Participants (n =1269)	Chi-square (X^2)	*p*-value
Comorbidities Coronary Artery Disease	17.0	15.4	.37	.54
Depression	18.3	13.3	3.93	.047
Hyperlipidemia	85.7	72.6	17.56	<.001
Hypertension	83.0	82.1	.12	.73
Current smoker	20.1	20.6	.24	.63
Most Common Year of Initial JFMA Visit	2009(51.7)	2009(61.7)	9.97	.076

Stepwise Sample Ascertainment



Aim 2A: Time Periods

- T_0 : six months before index date

- Index Date : Date of initial DISH visit (for participants)/Date of matched comparison group member's initial DISH visit (for controls)

- T_1: 0-3 months
- T_2: 4-6 months
- T_3: 7-9 months
- T_4 :10-12 months

Multiple values in given time period were averaged

Aim 2A Results: Measure Availability

DISH participants were significantly more likely to have measures for:

- HbA1c (all time periods except T_3)
- SBP (T_1)
- LDL (T_0,T_2, T_3)
- BMI (T_0, T_1 ,T_2, T_4)