

Translating Research Into Action for Diabetes

TRIAD

*A Multi-Center Study of Diabetes Care
in Managed Care Settings*

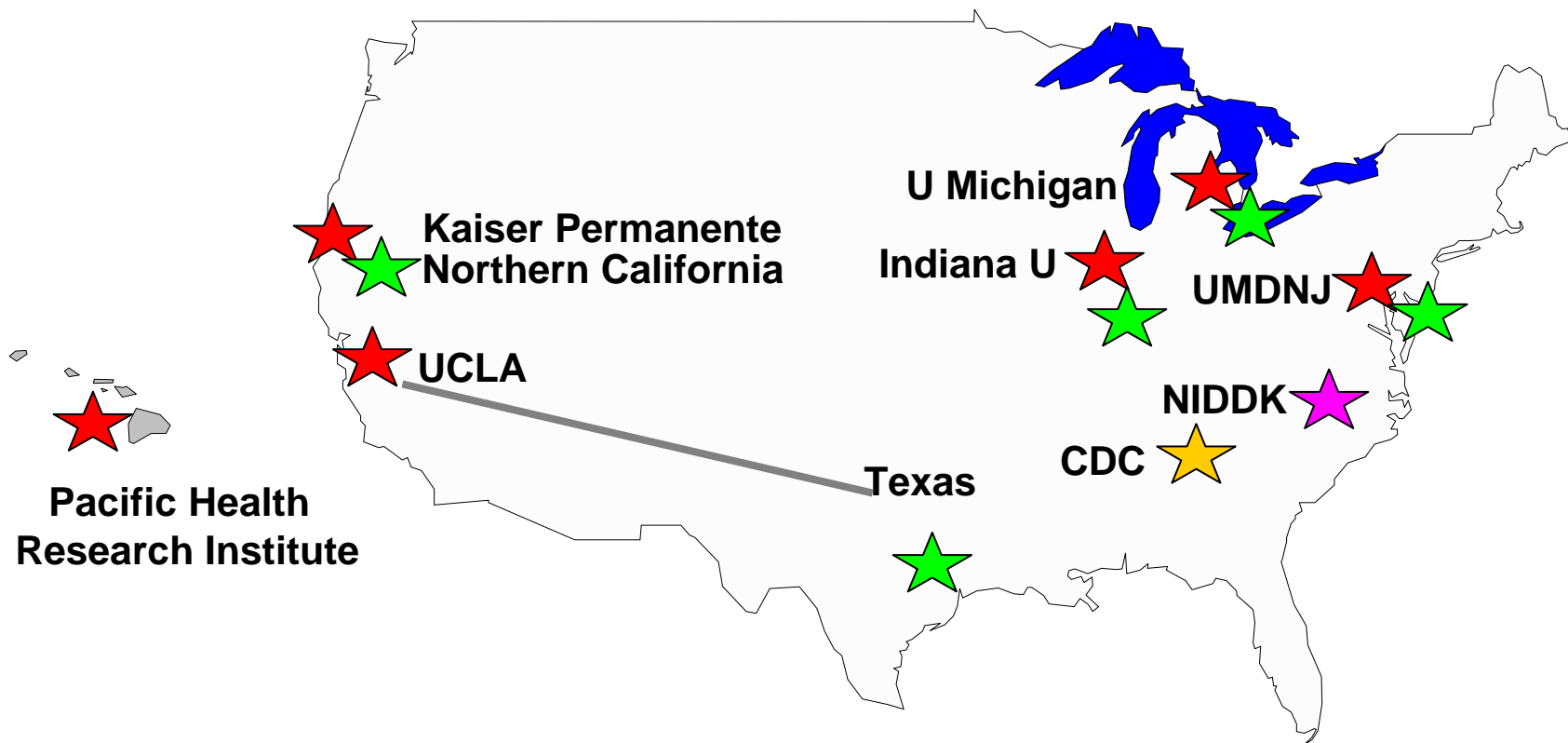
Outline


- TRIAD Study Overview
- Original Cohort & CVD Risk Studies
- Findings/Studies
 - Methodologic
 - Health System & Structural Factors
- Implications
- Next Phase of TRIAD
 - Site-specific Studies/Focused Studies
 - Natural Experiments
- Findings
 - Patient Factors
- Conclusions/Achievements
- Next Steps/Future Needs


Rationale for TRIAD - 1998

- Diabetes is a large, growing, costly and complicated challenge for the U.S. health care system.
- Many effective interventions are not being optimally implemented, indicating missed opportunities to reduce the burden of diabetes.
- Systems approaches (e.g., disease management) offer possibilities for improving diabetes care and outcomes.
- Managed care was an important setting in which to study the system-level barriers and facilitators to better care and outcomes.

TRIAD Sites and Sponsoring Agencies



 Translational Research Centers / TRIAD Study Sites

 Veterans Health Administration / TRIAD Study Sites (2000-2004)

 Centers for Disease Control - Sponsor

 National Institute of Digestive and Diabetes and Kidney Disorders - Sponsor

TRIAD Study Group: Principal Investigators and Sponsors

- **Indiana University**
David Marrero, PhD
- **Kaiser Permanente, N. California**
Joe Selby, MD, MPH
- **University of Michigan**
William Herman, MD, MPH
- **Pacific Health Research Institute**
David Curb, MD, MPH
- **University of Medicine and Dentistry of New Jersey**
Jesse C. Crosson, PhD
(Formerly Norman Lasser, MD, PhD)
- **UCLA School of Medicine**
Carol Mangione, MD, MSPH
- **Centers for Disease Control & Prevention - Sponsor**
Ed Gregg, PhD
Ted Thompson, MS
- **National Institute of Diabetes and Digestive and Kidney Diseases - Sponsor**
Sanford Garfield, PhD
- **VA TRIAD Study (5 sites)**
Eve Kerr, MD

Summary of TRIAD Objectives

1. **Descriptive** – Baseline and over time patient health status (quality of care), quality of life, health service use and health-related costs, with special attention to care among vulnerable populations
2. **Analytic** – Effectiveness of diabetes disease management strategies by health plans or provider groups; characteristics of plans, provider groups, and patients that enhance or impede the quality of diabetes care and/or the health status of members with diabetes

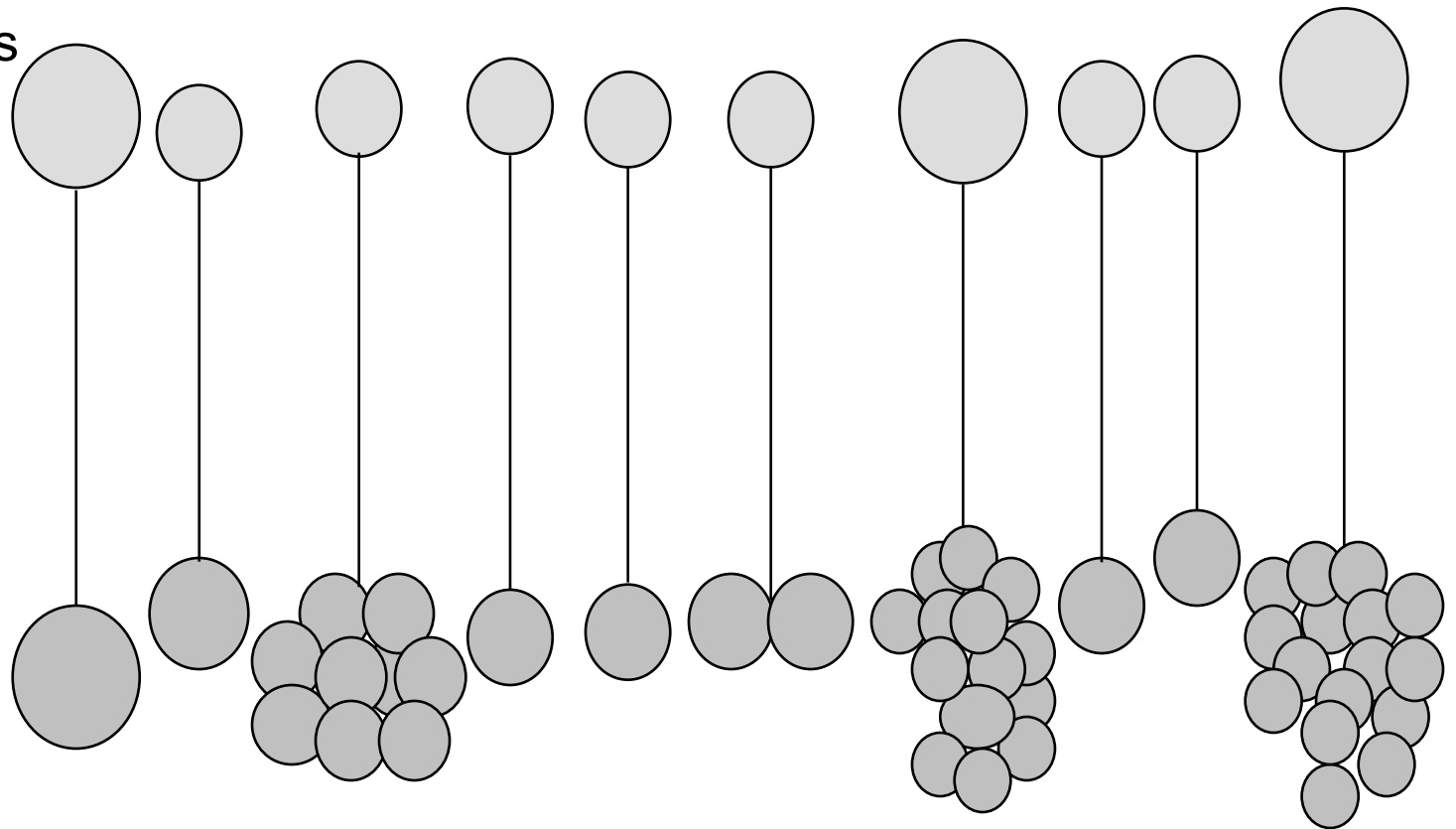
TRIAD Design and Structure

- **Multi-center study:** 10 managed care health plans.
- **Multi-level study:** diabetes outcomes study with assessment of 11,927 diabetic patients, linked to measurement of 68 provider groups, 10 health plans, and hundreds of communities that serve them.
- **Multi-design study:** Unified, multi-center cohort study with focused evaluations and natural experiments overlaid on broader structure.
- Diverse in age, gender, race/ethnicity, socioeconomic status, geography, and type of system.

TRIAD Nested Sampling Scheme

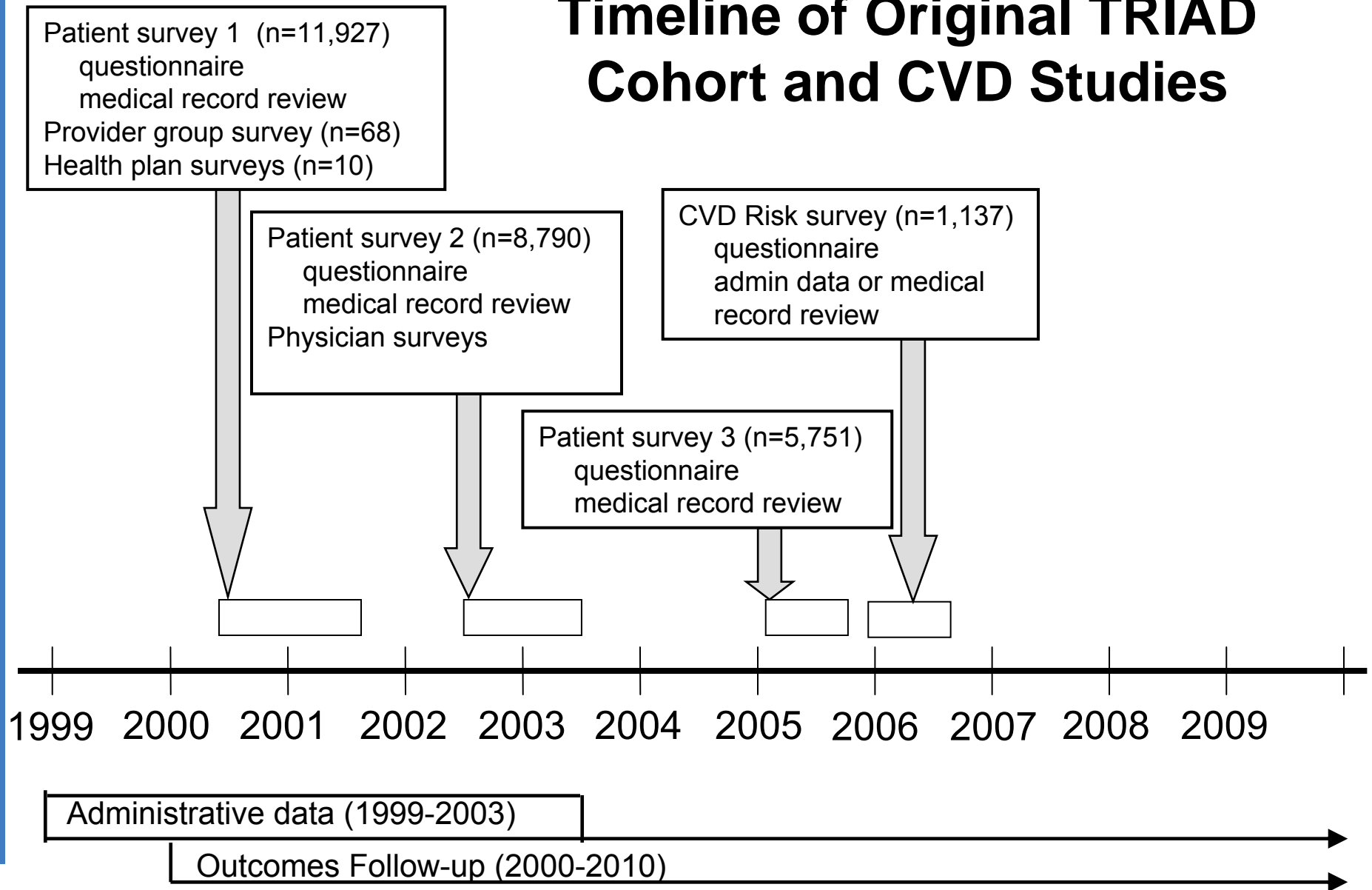
10 health plans
(n = 500 to
2000 per plan)

68 physician
groups with
> 50 members
in sampling
frame



Sampling scheme: Aimed for equal numbers from each physician group within health plan, so from 50 - 1500 per physician group

Timeline of Original TRIAD Cohort and CVD Studies



Original TRIAD Focus

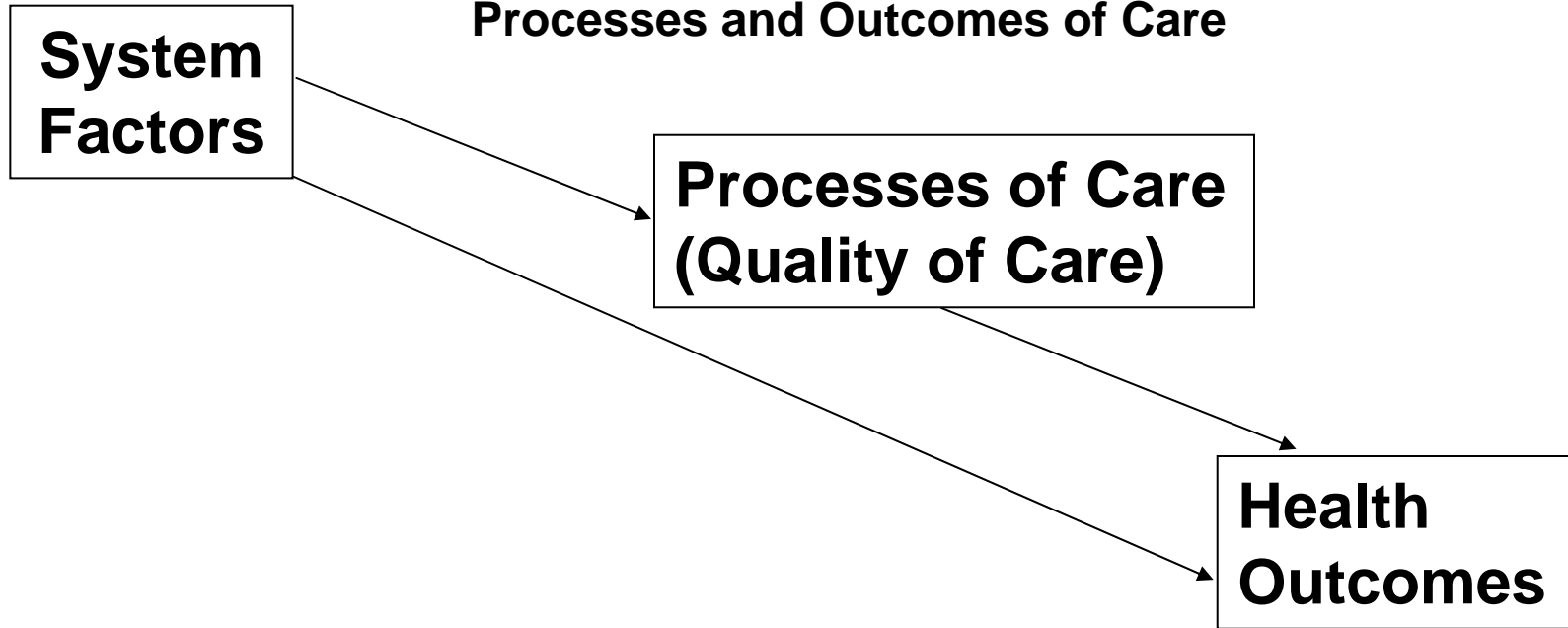
“**System-level**” analyses of managed care organizational characteristics and services:

- impact of diabetes interventions in everyday practice
- possibility that managed care creates barriers to care

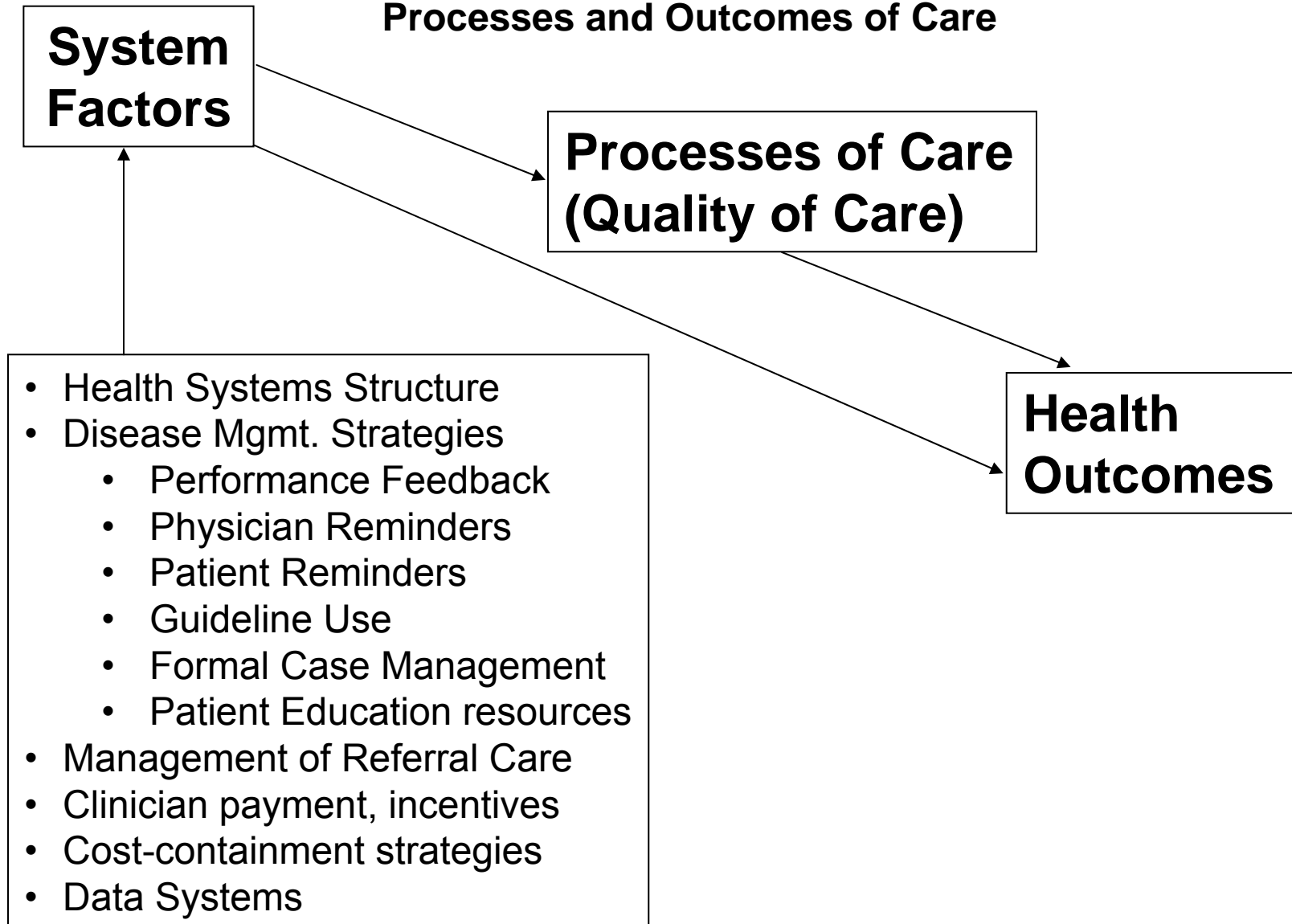
“**Patient-level**” factors in this large and diverse cohort of diabetic patients:

- variation in quality of care across diverse populations
- role of socioeconomic position on health status, health behaviors, diabetes complications, comorbidities

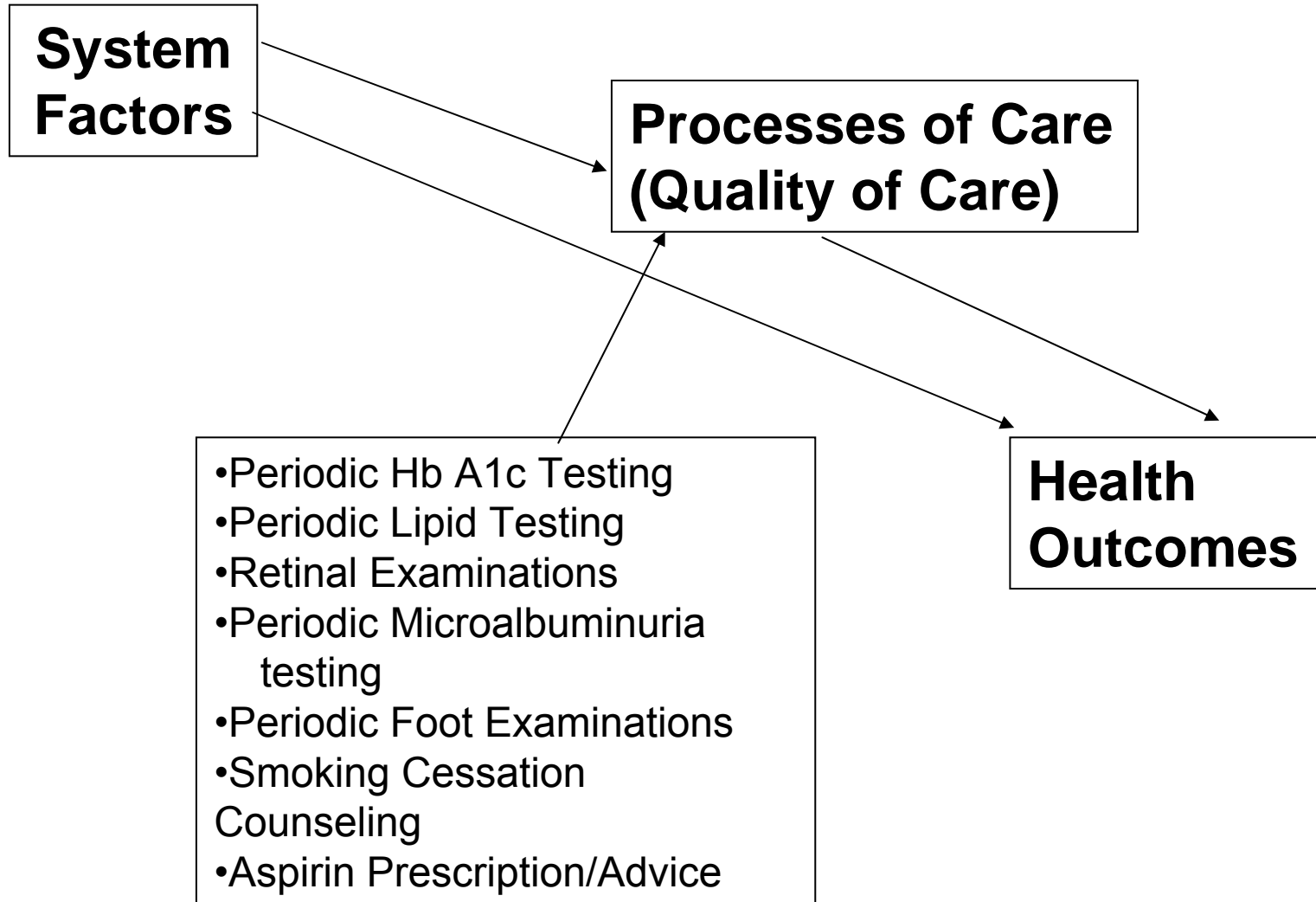
TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



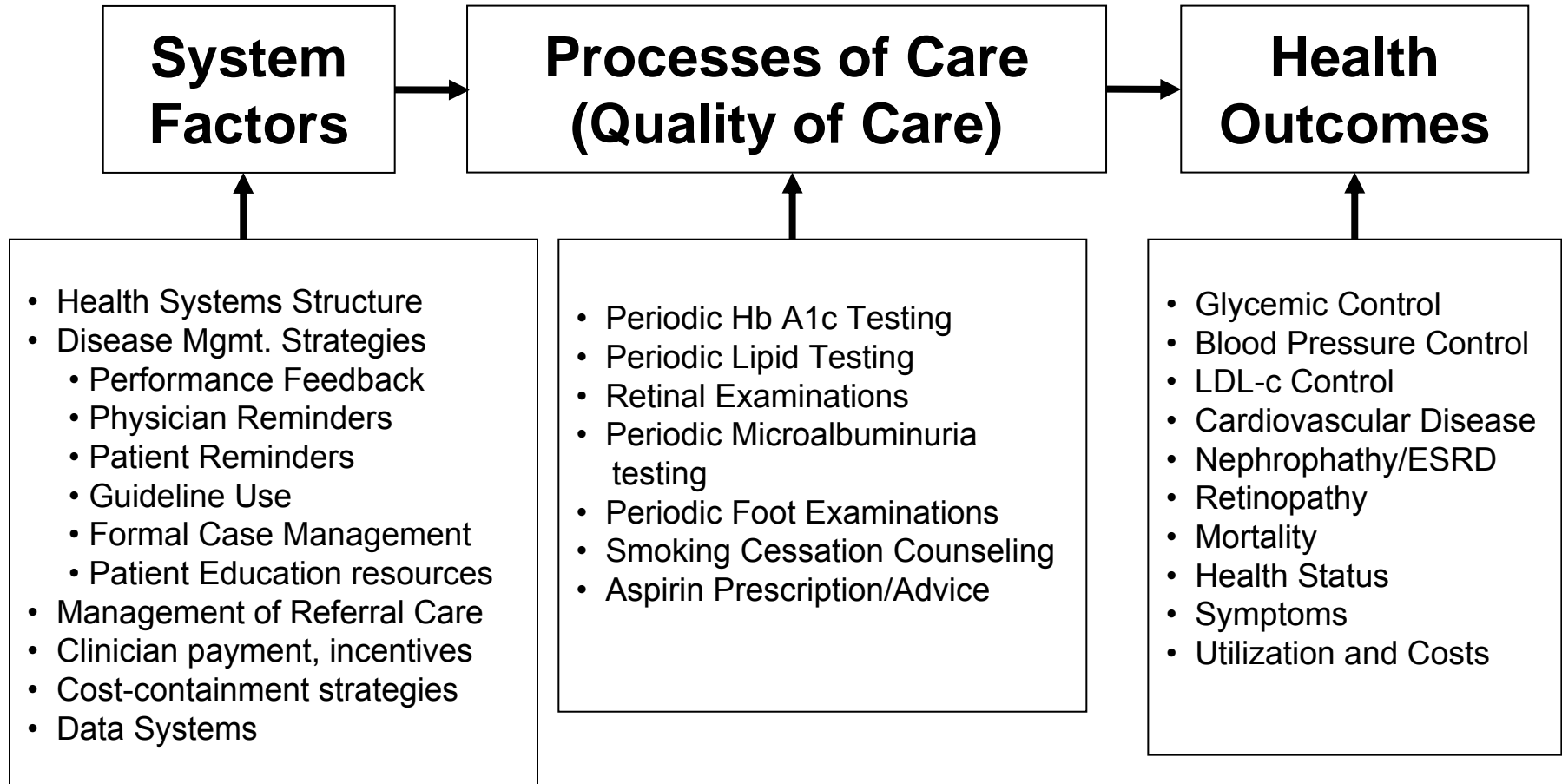
TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



TRIAD Conceptual Model for Relationships of System-Level Factors, Processes and Outcomes of Care



TRIAD Medical Director Surveys

	Total # Directors	Response Rate
Health Plan Directors (or designee)	10	100%
Physician Group Directors (or designee)	68	76%

TRIAD Cohort Size, Response Rates

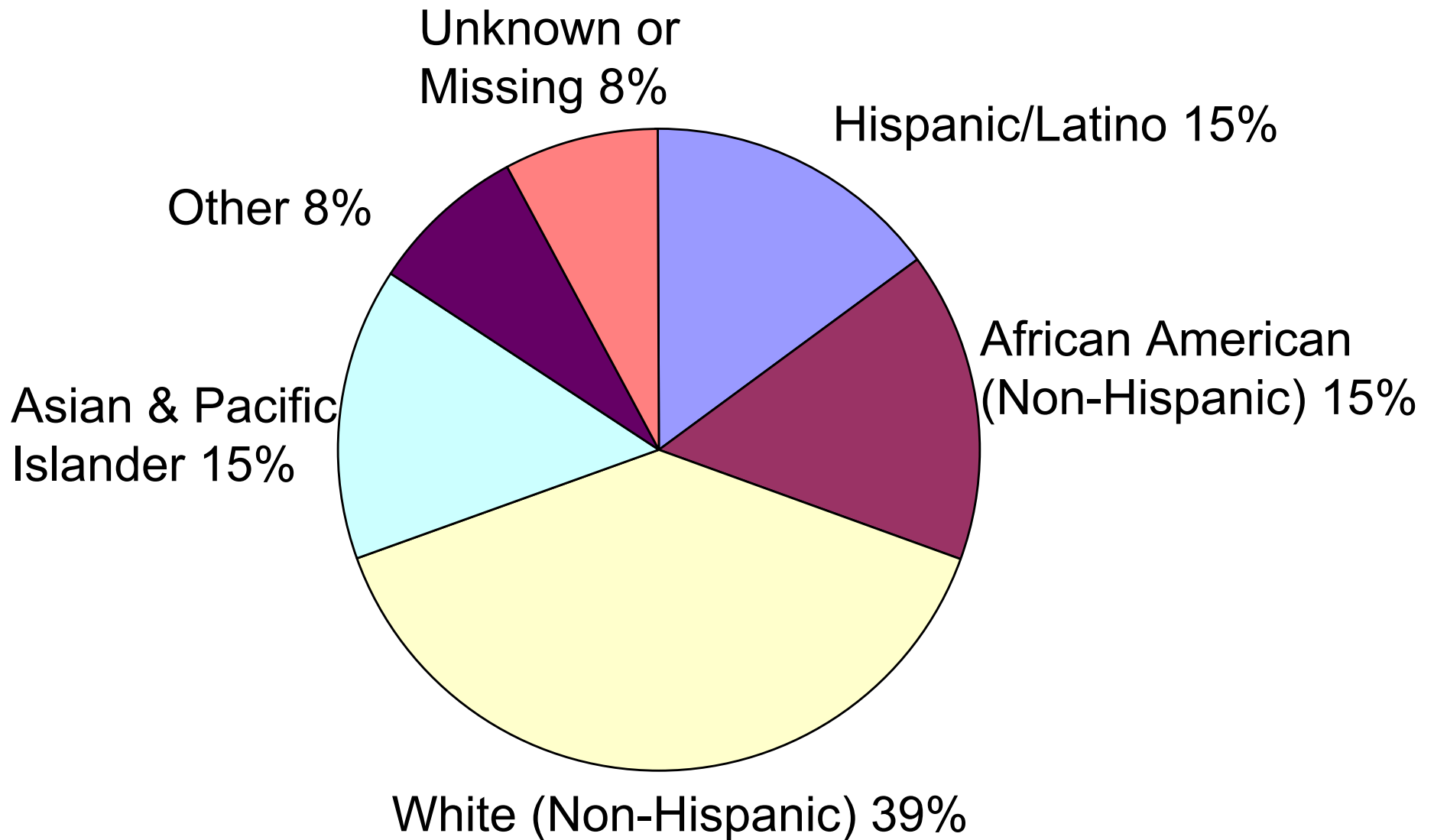
	Total # Participants	Adjusted* Response Rate	Participation Rate in Contacted Eligibles
Time 1	11,927	0.68	92%
Time 2	8,790	0.80	96%
Time 3	5,751	0.75	93%

*Adjusted for probable # of ineligible among those who could not be contacted (CASRO rate)

Original TRIAD Cohort Demographics

Category	Time 1	Time 2	Time 3
N (# of study participants)	11,927	8,790	5,751
Male (%)	47%	47%	46%
Female (%)	53%	54%	54%
Ages (avg.)	60 years	62 years	64 years
Age Groups:			
18-44	12%	10%	6%
45-64	49%	48%	45%
≥ 65	39%	42%	50%
BMI (avg.)	31.1	31	31.2
Duration of diabetes (avg. years)	12 years	13 years	16 years
HbA1c (avg.)	8.0%	7.8%	7.8%
Total Cholesterol (avg.)	197.5 mg/dl	191.6 mg/dl	191.6 mg/dl

Original TRIAD Cohort Ethnicity



Ethnicity of Original TRIAD Cohort Over 3 Rounds of Surveys*

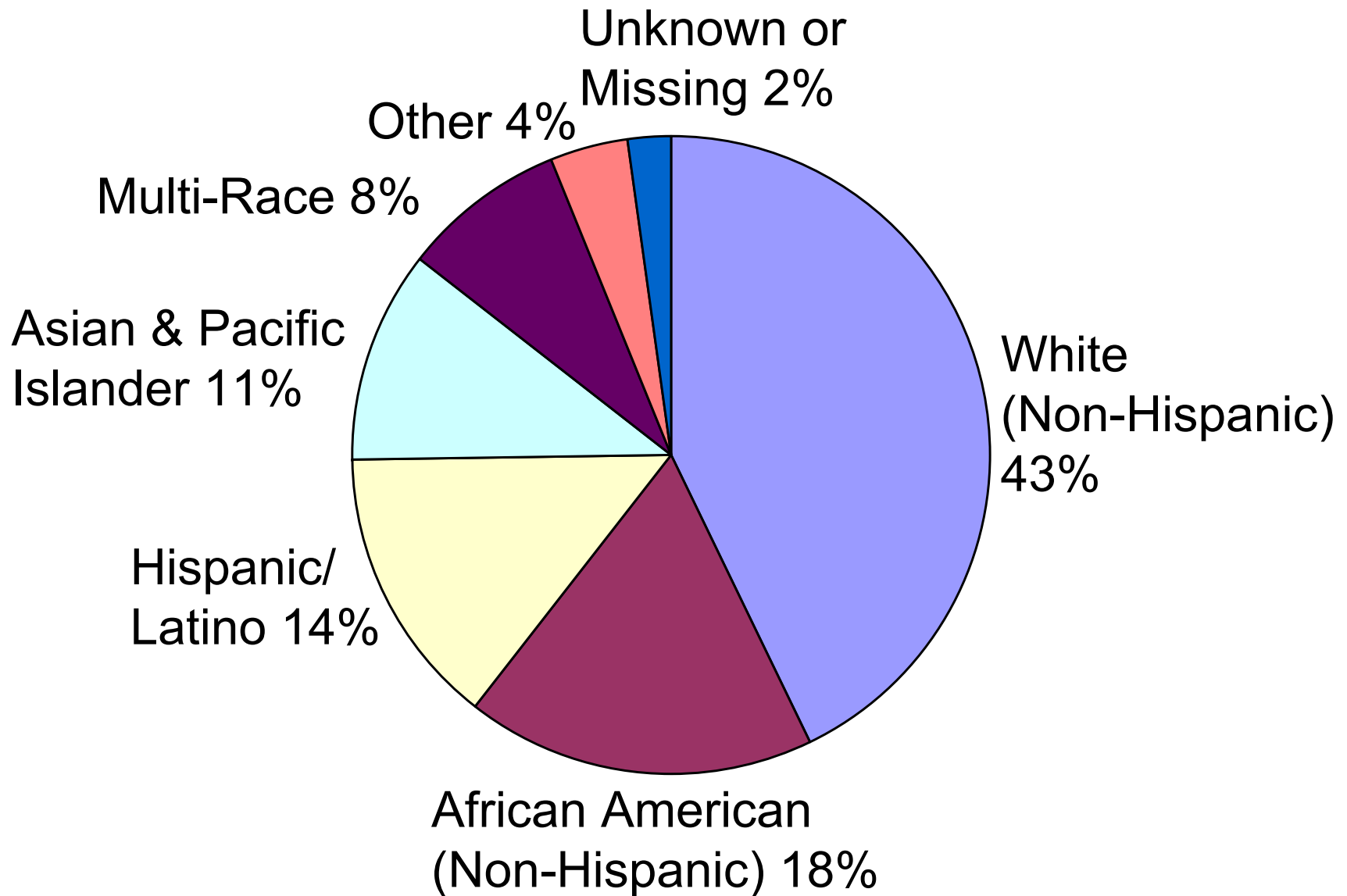
	Total # Participants	White (Non- Hispanic)	African American (Non- Hispanic)	His- panic/ Latino	Asian and Pacific Islander	Other
Time 1	11,927	39%	15%	15%	15%	8%
Time 2	8,790	41%	14%	15%	15%	8%
Time 3	5,751	43%	14%	14%	15%	8%

*8%, 7% and 6% were unknown or missing in Times 1, 2, and 3, respectively

CVD Risk Factor Study Demographics

Category	CVD Risk Factor Survey
N (# of study participants)	1,137
Male (%)	43%
Female (%)	57%
Ages (avg.)	63 years
Age Groups:	
18-44	5%
45-64	51%
≥ 65	44%
BMI (avg.)	32.5
Duration of diabetes (avg. years)	13 years
HbA1c (avg.)	7.6%
Total Cholesterol (avg.)	107.4 mg/dl

CVD Risk Factor Study Ethnicity



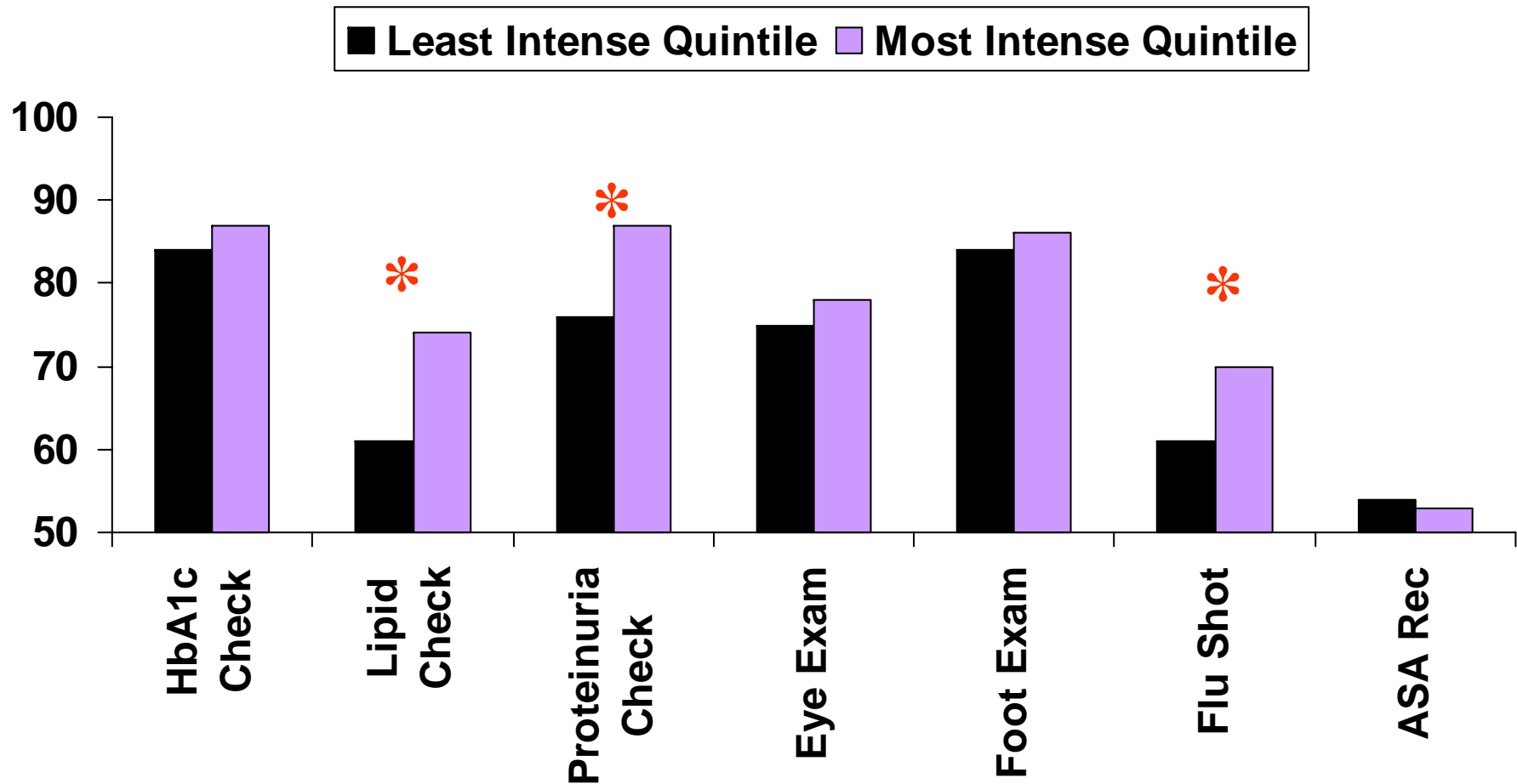
TRIAD Methodologic Studies

1. The TRIAD Study is a multicenter study designed to determine how the structure and organization of managed care systems influence the processes and outcomes of diabetes care – The TRIAD Study Group, Diabetes Care, 2002.
2. A conceptual framework for the mechanisms linking SEP to the health of persons with diabetes – Brown et al., Epidemiology Review, 2004.

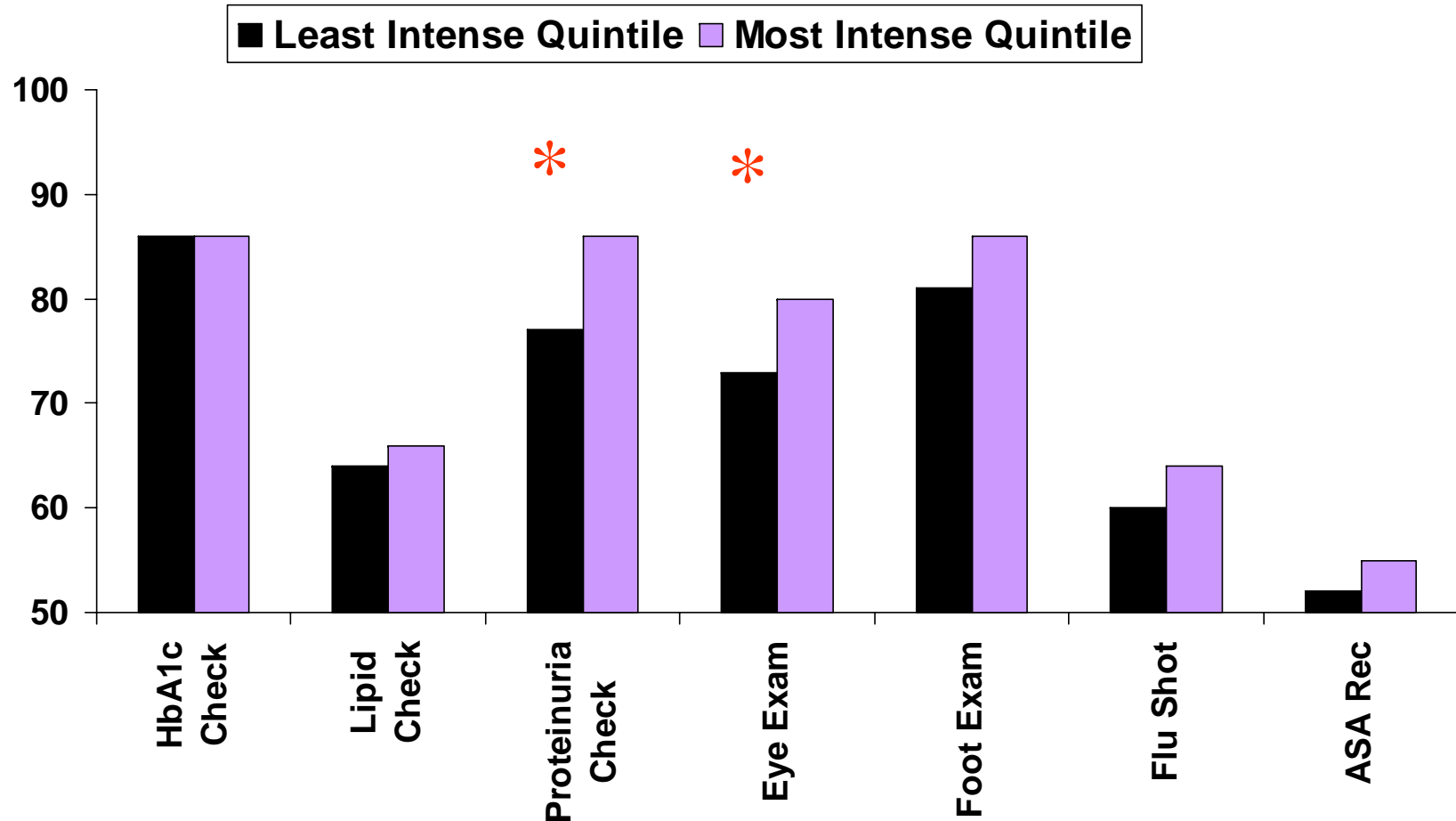
Health System and Structural Factors Findings

- Quality-Related
- Cost-Related
- Data System Related

Predictor: Practice Group (PG) Diabetes Registry Use

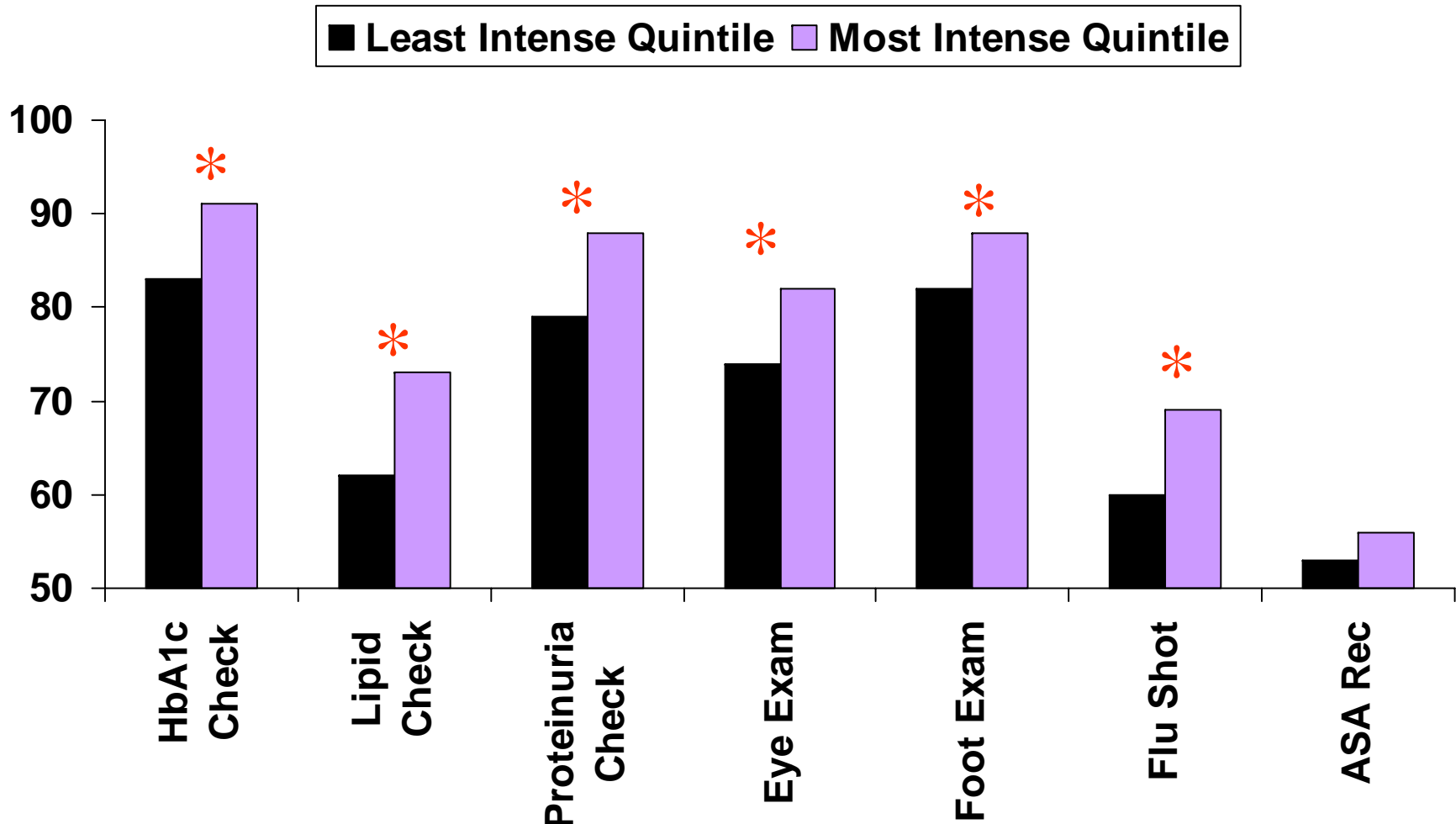


Predictor: PG Physician Reminders



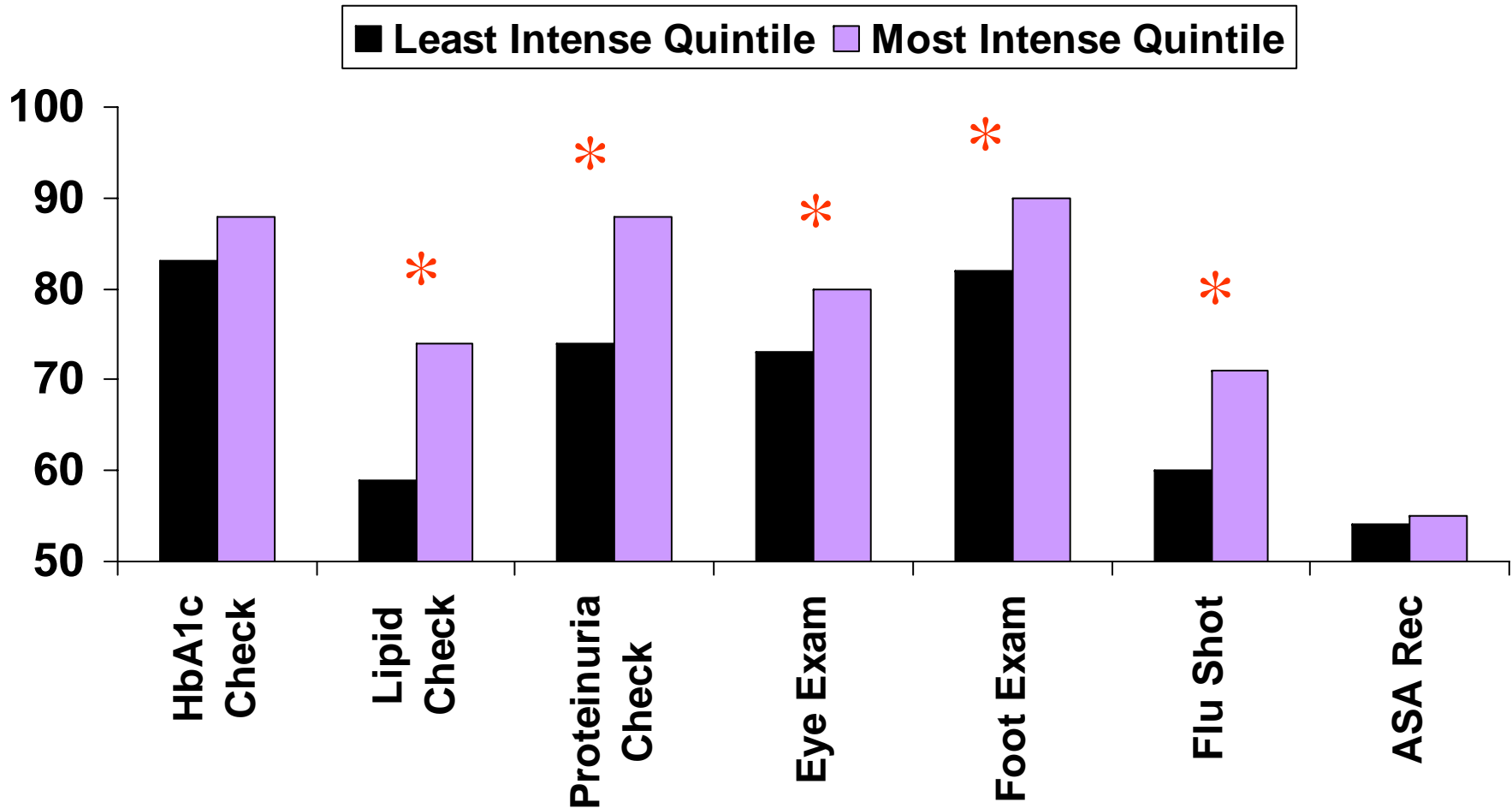
* significant $p \leq .05$

Predictor: PG Physician Feedback



* significant $p < .05$

Predictor: PG Diabetes Care Management



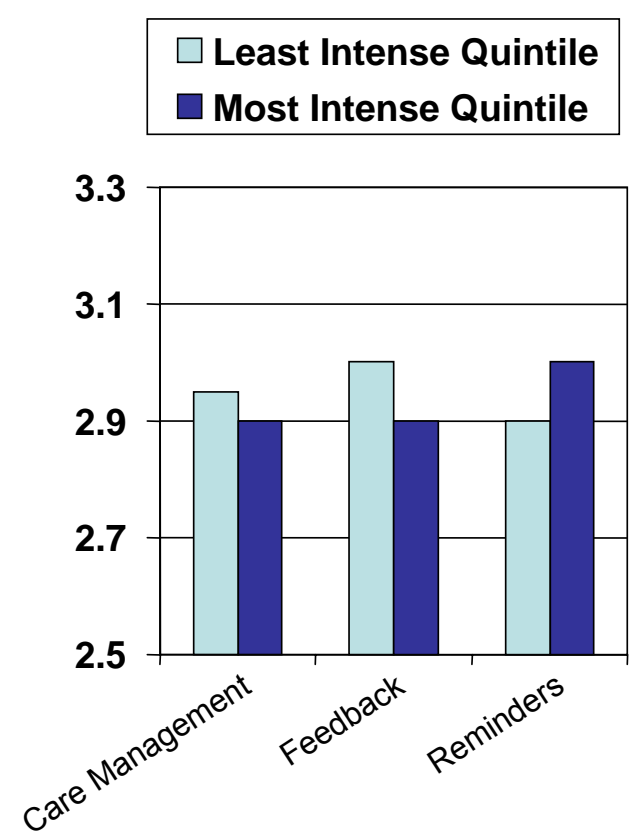
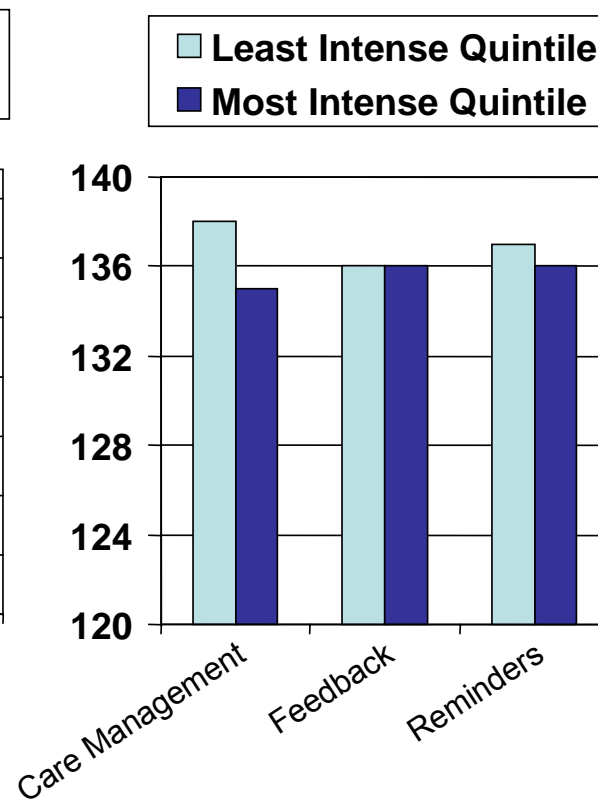
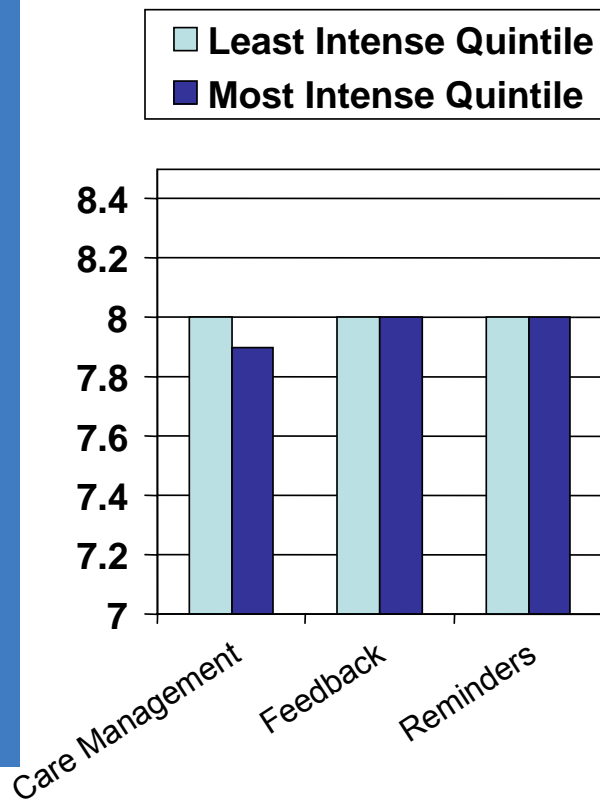
* significant $p \leq .05$

Association Between Disease Management Intensity and Levels of Risk Factor Control

A1c

Systolic Blood Pressure

Serum LDL



Adjusted Quality-of-Care Rates for Veterans Affairs and Commercial Managed Care Participants*

Quality-of-Care Measure (Data Source)	VA Rate (95% CI) (n= 1273), %	CMC Rate (95% CI) (n= 6901), %	P Value
Processes of Care			
Annual eye exam (hybrid)	91 (87–93)	75 (69–80)	<0.001
Eye exam (medical record)	57 (38–75)	28 (16–46)	0.03
Eye exam (survey)	88 (84–92)	72 (67–77)	<0.001
Annual hemoglobin A1c test	93 (89–96)	83 (76–87)	0.005
Annual lipid screening	79 (69–86)	63 (51–73)	0.02
Annual foot exam (hybrid)	98 (96–99)	84 (79–88)	<0.001
Foot exam (medical record)	87 (80–91)	50 (40–60)	<0.001
Foot exam (survey)	92 (88–95)	76 (69–82)	<0.001
Annual proteinuria screening	92 (89–95)	81 (75–86)	0.005
Aspirin use counseling	75 (69–79)	49 (44–53)	<0.001
Influenza vaccination	72 (66–77)	64 (60–68)	0.04
Intermediate Outcomes			
Blood pressure < 140/90 mm Hg	53 (46–60) [1222]	52 (47–57) [6161]	>0.2
Blood pressure < 130/85 mm Hg	29 (23–35) [1222]	29 (25–34) [6161]	>0.2
Hemoglobin A1c value <9.5%	92 (87–95) [1173]	80 (72–86) [5769]	0.006
Hemoglobin A1c value <8.5%	83 (75–89) [1173]	65 (54–75) [5769]	0.009
LDL cholesterol level <3.37 mmol/L (<130 mg/dL)	86 (81–90) [995]	72 (68–76) [4398]	0.002
LDL cholesterol level <2.59 mmol/L (<100 mg/dL)	52 (45–59) [995]	36 (32–40) [4398]	0.003

* Higher rates represent higher quality. CMC = commercial managed care; LDL = low-density lipoprotein; VA = Veterans Affairs.

Health System and Structural Factors Findings - Quality-Related (cont.):

1. Quality of care, A1c and LDL-c control were substantially better in the VA system than in TRIAD centers. Blood pressure and patient satisfaction did not differ – Kerr et al., Ann Intern Med, 2004.
2. Disease management is strongly associated with processes of care but not risk factor control – Mangione et al., Ann Intern Med, 2006.

Quality-Related (cont.):

3. Processes of care at the provider group level are related to patient satisfaction and perceptions of quality, but not HbA1c or SBP – Ackermann et al., Diabetes Care, 2006.
4. Among for-profit plans, group/network model provider groups have higher quality scores than IPA models – Kim et al., Diabetes Care, 2004.

Quality-Related (cont.):

5. Only 20-23% of patients in poor control appeared to have poor medication adherence, whereas 30-47% of patients had good adherence but pharmacotherapy had not been intensified in response to the poor control – Schmittdiel et al., J Gen Intern Med, 2008.

6. Health plan referral management practices are not related to rates of retinal exams or access to specialty care or to patient satisfaction or perception of difficulty getting referrals– Kim et al., Am J Managed Care, 2004.

Cost-Related:

1. Physician reimbursement by salary or capitation is associated with higher quality (processes) scores than FFS – Ettner et al., Health Services Res, 2006.
2. After adjustment, physicians who reported getting more than 90% of compensation from salary were not more likely to perform common diabetes processes of care than physicians in fee-for-service models– Kim et al., J Gen Intern Med, 2007.

Cost-Related (cont.):

3. Greater out-of-pocket costs (through co-pays, non-coverage) are associated with lower rates of retinal exams, health education, and self-monitoring of blood glucose – Karter et al., Diabetes Care, 2003.
4. Respondents reported using less medication than recommended because of costs – Tseng et al., Diabetes Care, 2008.

Data System Related:

1. Case-cohort designs can be useful for large-scale community trials, or for studies that utilize concurrent registry data that record health or vital outcomes, such as the example from TRIAD data – Lu et al., Biometrics, 2006.
2. Concordance between self-report and medical records for recent retinal exams was poor. Self-reports indicated a higher performance of annual dilated eye examinations than did medical records – Beckles et al., Medical Care, 2007.

Data System Related (cont.):

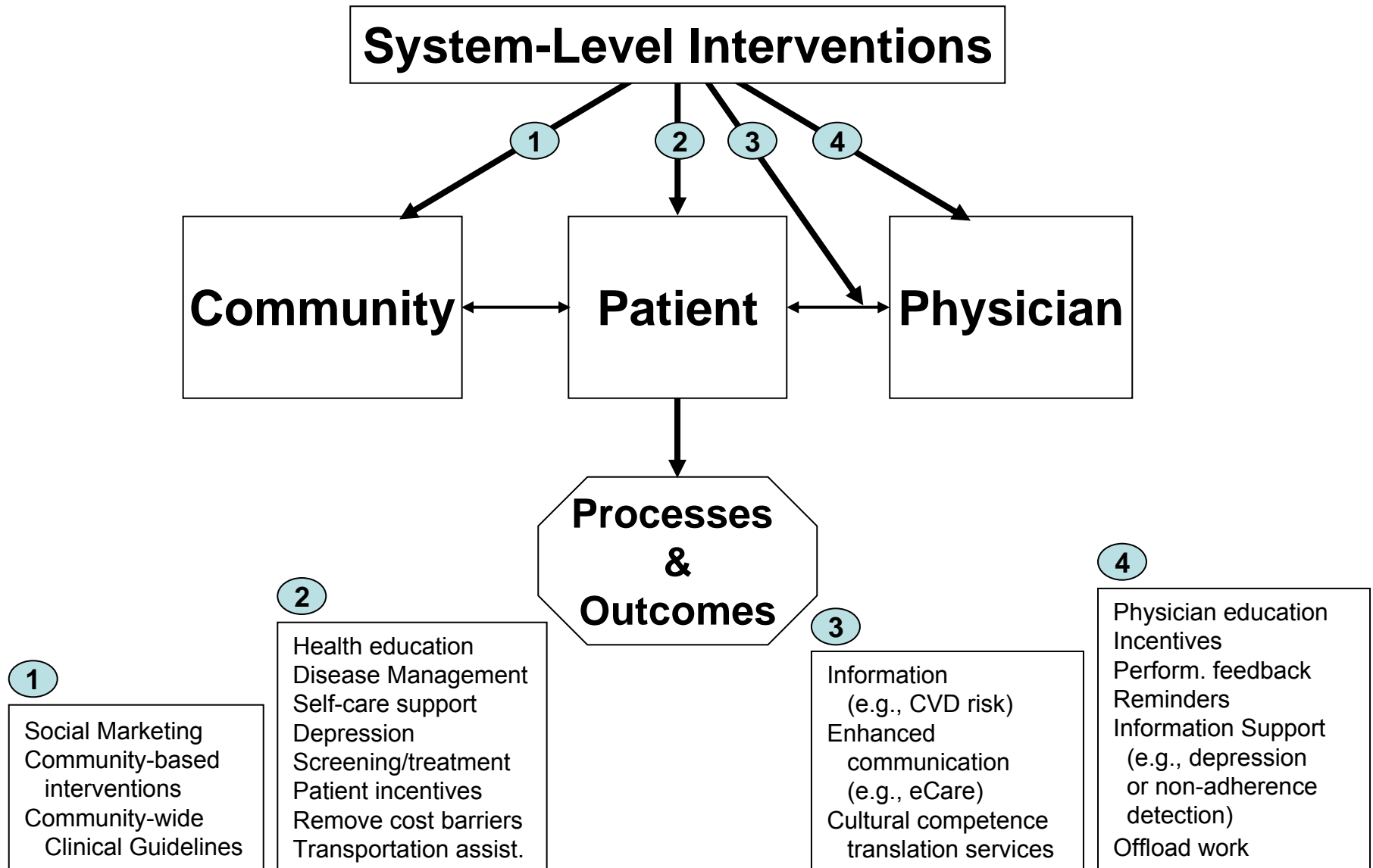
3. Diabetes is much more likely to be reported on the death certificates of diabetic individuals who die of cardiovascular causes – McEwen et al., Diabetes Care, 2006.
4. There is a strong association between recording of diabetes on the death certificate and the certifying physician being the PCP after adjustment for covariates– McEwen et al., Diabetes Care, 2008.

Implications

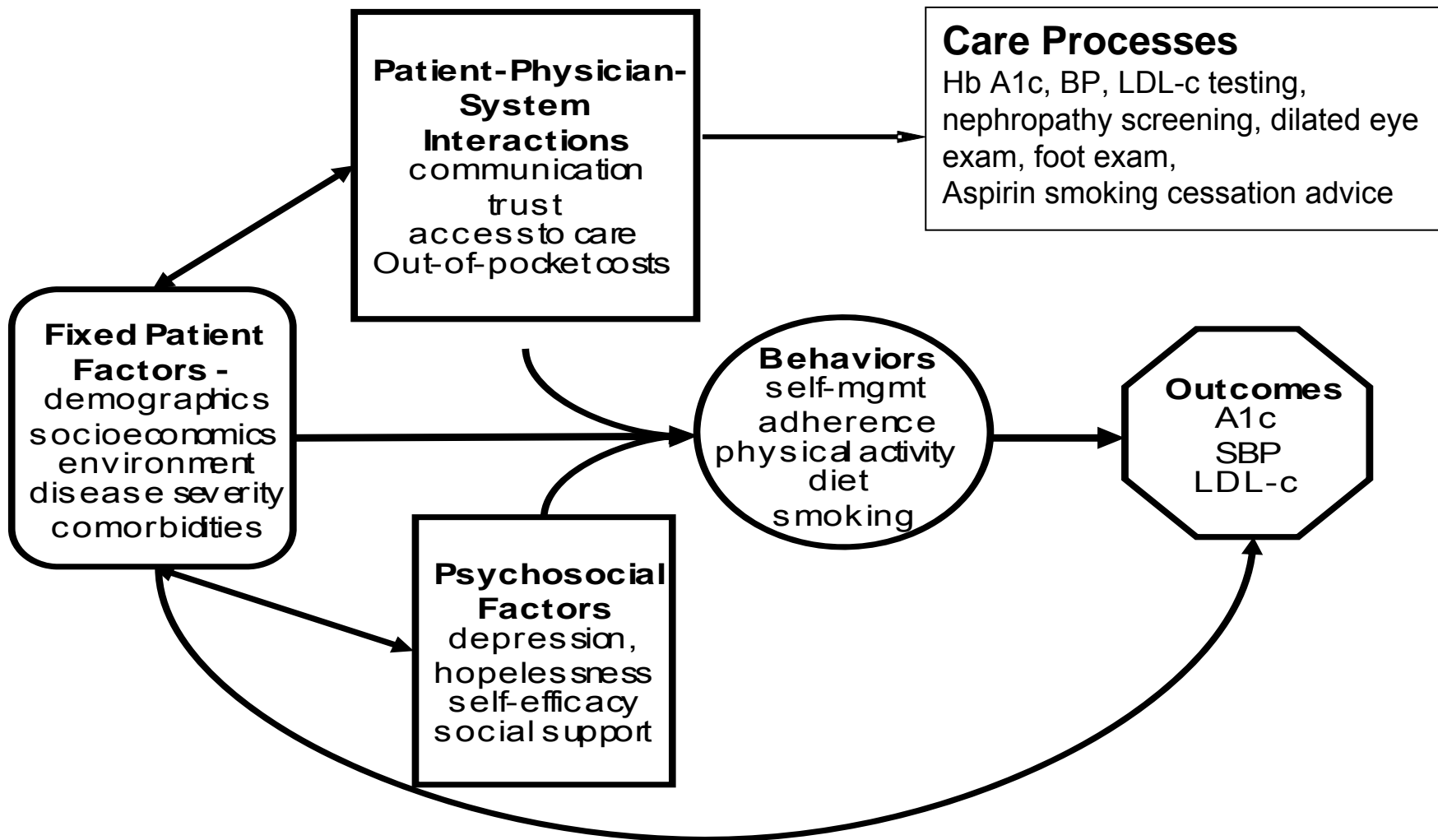
- Disease management is effective, but needs to be better linked to:
 - Intermediate health outcomes
 - Processes of care that more directly affect health outcomes
 - Patient characteristics
- Are we ready for a new generation of quality of care indicators?

Models that Explain Relationships Between Systems and Patient Factors

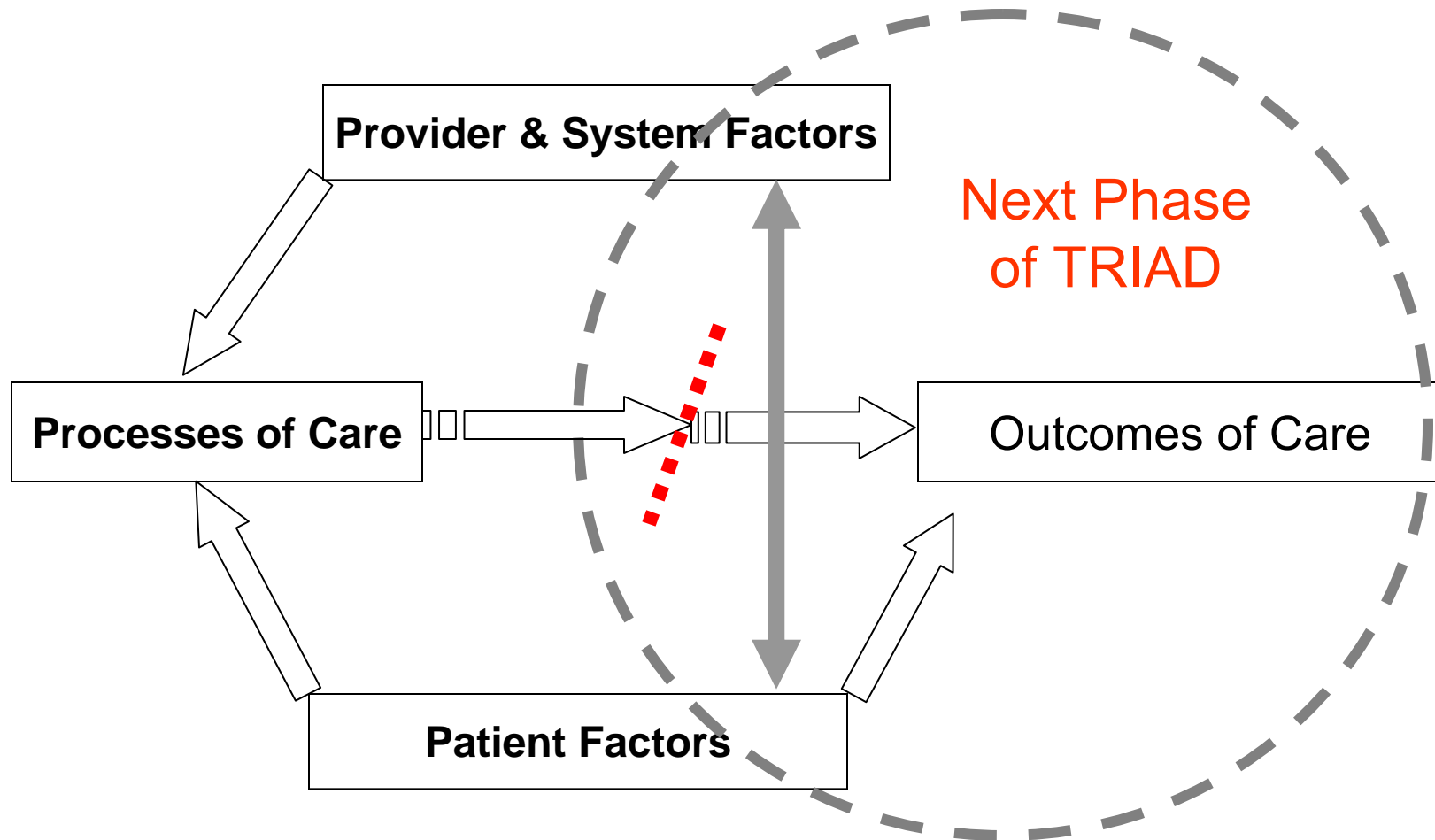
TRIAD “Catalog” of Health Plan Interventions



Possible Relationships of Patient Factors and Patient-System Interactions with Processes and Outcomes of Care



Pathways to Improved Outcomes



The Next Phase of TRIAD 2006-2010

- Site-Specific Studies
- Focused-Theme Studies
- Natural Experiments

Site-Specific Studies and Focused Theme Topics

- Patient and provider factors in CVD risk factor control
 - qualitative and quantitative research
- Medication adherence
- Evaluation of the effects of Medicare Part D policy
- Barriers to insulin initiation and treatment intensification
- Factors underlying health care disparities
- Managed care-community partnerships to prevent DM
- Development and evaluation of high risk identification approaches for primary prevention
- Gestational diabetes care
- Aging and diabetes

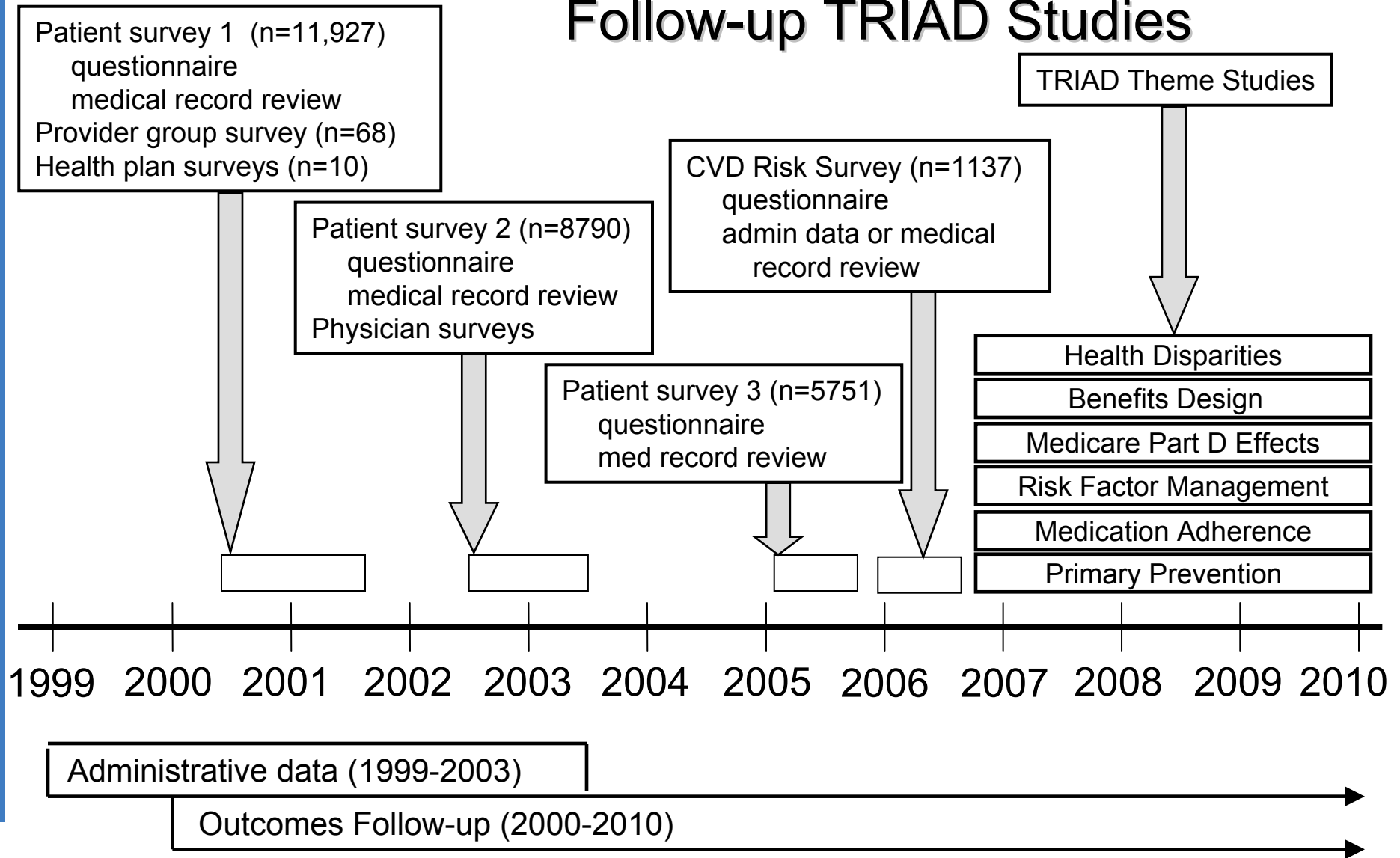
Natural Experiments

- Copayment reduction: University of Michigan *Focus on Diabetes Program*
- Disease Management and prevention of chronic kidney disease
- Medicare Part D coverage gap
- Pay-for-Performance
- Mail-order pharmacy

Natural Experiments (cont.)

- Enhancing patient-provider communication about CVD risk factors.
- Understanding physician and patient attitudes about poor CVD risk factor control.
- Predictors, barriers, and outcomes of treatment intensification
- Hawaii Diabetes Data Network
- Diabetes and Aging Work Group (polypharmacy, treatment intensification, depression, cost)

Timeline of Original TRIAD and Follow-up TRIAD Studies

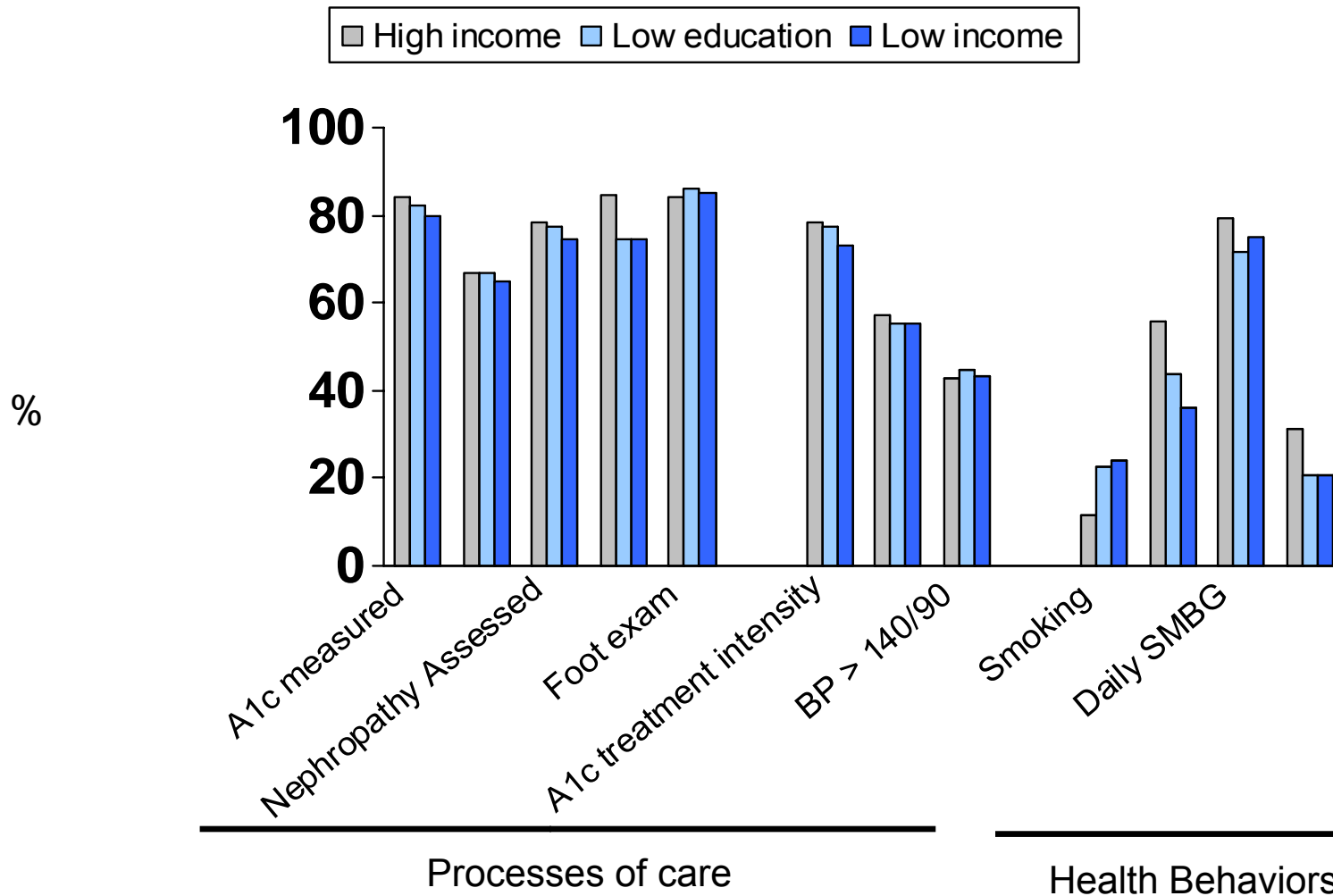




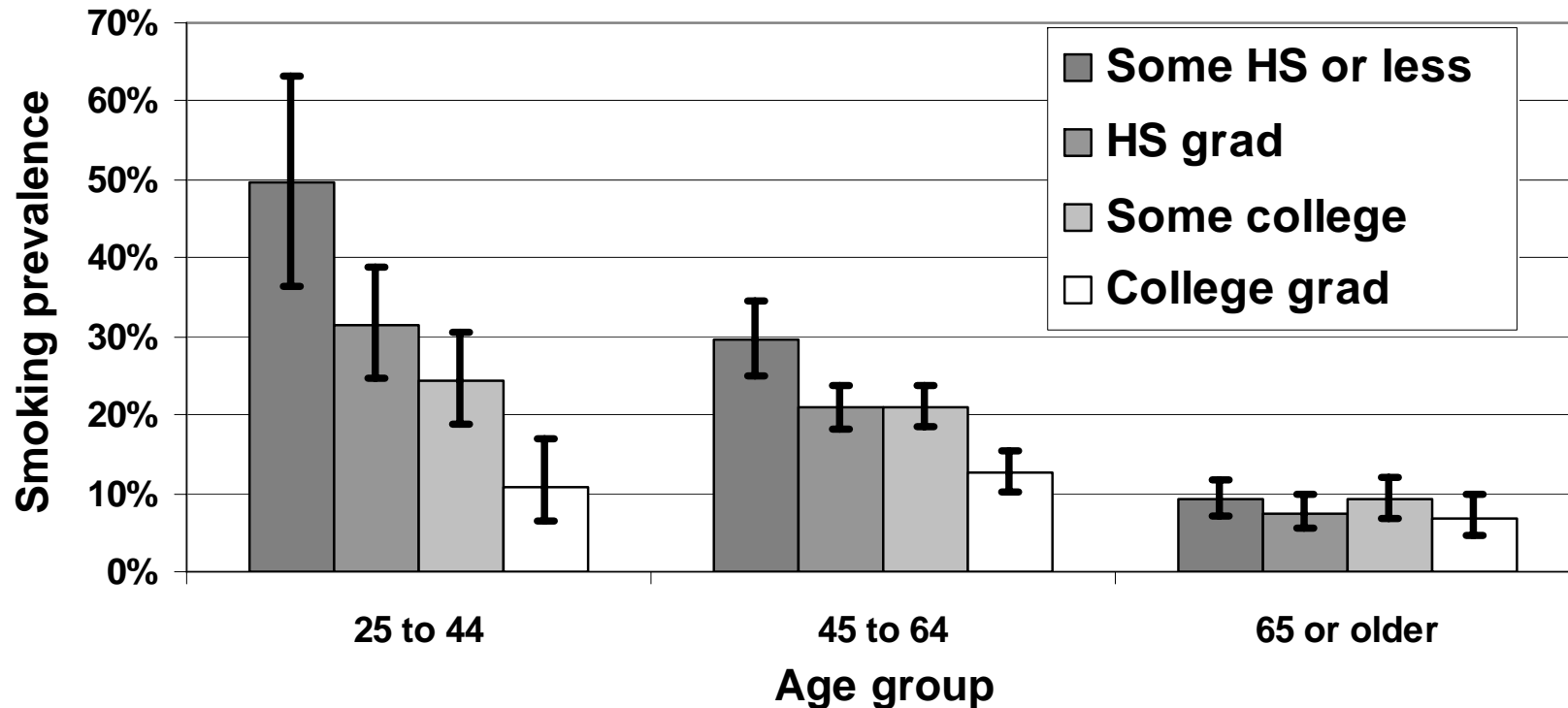
Patient Factor Findings

- Disparities
- Pain and/or Depression
- Gestational Diabetes
- Physician Factors
- Intensity of Treatment

Prevalence of Processes of Care and Health Behaviors among Vulnerable Groups



Prevalence* of smoking among adults with diabetes, across age groups and educational attainment. *Translating Research Into Action for Diabetes (TRIAD) study survey (2002-2003).*



*Prevalence (95% confidence intervals) based on predicted probabilities generated from the hierarchical logistic regression model (accounting for clustering within health plan) and adjusted for age group, sex, race/ethnicity, Spanish-speaking, employment status, duration of diabetes, type of diabetes treatment, health education class attendance in past year, presence of depressive symptoms, and presence of a cardiovascular risk. There was a significant age-by-education interaction ($p=0.0025$).

Patient Factor Findings

Disparities:

1. Processes of care differ little by race/ethnicity but non-white patients have higher A1c levels and African Americans have higher SBP levels than whites – Brown et al., Diabetes Care, 2005.
2. Few differences exist between Spanish-speaking and English-speaking Latino patients for processes of care; however, mean A1c levels were somewhat higher for Spanish-speaking than English-speaking Latinos – Brown et al., Am J Publ Hlth, 2003.

Disparities (cont.):

3. Both African Americans and Latinos reported spending “more extra time” than whites on several diabetes self-care behaviors, including foot care, shopping for and cooking diabetic meals, and exercising to manage diabetes – Ettner et al., Health Econ, 2008.

4. Greater intensity of 3 disease management strategies was associated with smaller racial/ethnic disparities for some, but not all, care process measures, but these disparities were quite small overall. It did not appear to reduce the somewhat larger disparities in risk factor control – Duru et al., Medical Care, 2006.

Disparities (cont.):

5. Living in an impoverished neighborhood was associated with lower rates of blood pressure control, higher rates of smoking, and slightly lower physical and emotional well being scores, after adjustment for individual SES – Gary et al., Diabetes Care, 2008.

6. Among people with diabetes and access to medical care, older age, male sex, smoking, and renal disease are important predictors of mortality - McEwen et al., Diabetes Care, 2007.

Disparities (cont.):

7. Patients, ages 25 and over, with less education were significantly more likely to smoke, and less likely to engage in regular exercise or in other health-seeking activities (diabetes health education, website, or support group) – Karter et al., BMC Public Health, 2007.

8. Women with diabetes are less likely to be on aspirin and statins and to have LDL tested – Ferrara et al., Diabetes Care, 2004.

Disparities (cont.):

9. Slightly worse levels of several cardiovascular disease care processes and intermediate outcomes were found in diabetic women compared with men – Ferrara et al., Diabetes Care, 2008.

10. Even among patients receiving appropriate processes of care, younger persons were less likely to have good control of risk factors (combined measure of A1c, LDL, and SBP control) – Selby et al., Med Care, 2007.

Disparities (cont.):

11. Young diabetic patients (25-44 years) with less than HS education are much more likely to smoke than college grads – Karter et al., Am J Publ Health, 2008.

12. Among adult patients with Type 1 diabetes, those who had been diagnosed between 10 and 13 years of age had higher odds of smoking as adults than those diagnosed either earlier or later, and higher myocardial infarction risk than patients diagnosed earlier – Carroll et al., Diabetes Care, 2007.

Pain and/or Depression:

13. Pain, obesity, and new comorbidities were moderately associated with decreases in sustained walking, especially in patients ≥ 65 years – Duru et al., J Gen Intern Med, 2008.

14. Self-reported depression was more frequent and a much stronger predictor of poor risk factor control for African Americans, and more frequently untreated – Duru et al., in press at Medical Care, 2008.

Gestational Diabetes:

15. More than 80% of women with a history of gestational diabetes (GDM) reported receiving counseling on lifestyle modification and postpartum screening during the pregnancy but less than one-third reported receiving postpartum diabetes screening – Kim et al., Diabetes Care, 2007.

16. 90% of women with a history of GDM recognized that GDM was a risk factor for future diabetes, but only 16% believed that they themselves had a high chance of developing diabetes – Kim et al., Diabetes Care, 2007.

Gestational Diabetes (cont.):

17. Women had low self-efficacy and social support for a healthy diet and physical activity.– Kim et al., Diabetes Educ, 2008.

18. In women of childbearing age, older age, higher BMI, and no insulin use were associated with lower likelihood of pre-conception counseling regarding glucose control and family planning – Kim et al., Am J Ob Gyn, 2005.

Gestational Diabetes (cont.):

19. Stress urinary incontinence is common among women with a history of GDM but does not appear to be associated with physical activity levels or BMI – Kim et al., J Women's Health, 2008.

Physician:

20. Physician sex was not associated with processes of care, intermediate outcomes or patient satisfaction – Kim et al., Diabetes Care, 2005.

21. Neither physician age, sex, number of years in practice, or specialty were important determinants of mammography or Pap smear screening – Tabaei et al., Diabetes Care, 2005.

Physician (cont.):

22. Physicians who believed they received direct reimbursement for ordering outpatient tests were not any more likely to order these tests, with the single exception of electrocardiograms
- Kim et al., Am J Manag Care, 2008.

Intensity of Treatment:

23. Patients with diabetes are under-treated with CADE/ARB after screening for microalbuminuria – Johnson et al., Diabetes Care, 2006.

24. Relatively high rates of failure to intensify treatment in the face of poor risk factor control may prove to be a useful process measure of quality. Higher treatment intensification rates have been linked to better risk factor control – Selby et al., Medical Care, 2008.

Conclusions

1. Processes are easier to influence than outcomes, so develop, measure, and incent clinically effective process measures: e.g., treatment intensification, use of statins, ACE-inhibitors, aspirin, smoking cessation advice.
2. Disease management strategies were associated with better processes of diabetes care but not with improved intermediate outcomes.
3. Poor “reach” or penetration of programs may help to explain apparent lack of effectiveness for outcomes.

Conclusions (Continued)

4. Greater integration (better data systems, stronger culture, aligned incentives, effective communication) appear to lead to better processes and possibly to better outcomes (VA comparison).
5. Cost-shifting to patients invariably leads to reduced adherence, worsening outcomes.
6. Younger age and few, if any, comorbidities identify patients who may need special targeting.

Conclusions (Continued)

7. Racial/ethnic and socioeconomic disparities in outcomes persist within these insured populations – especially for African American patients.
8. Monitoring/reporting quality measures by race/ethnicity and educational level is a first step in understanding and eliminating them.

Conclusions (Continued)

9. Factors identified in TRIAD that may explain poor outcomes and disparities in outcomes:
 - possible differences in cost-sensitivity
 - poorer self-care behaviors
 - higher frequency of depression with lower rates of treatment
 - possible diminished trust in physicians/systems
 - neighborhood poverty
 - less frequent physician visits
 - less attention to risk factor control by health care providers
 - more severe disease among younger persons in the cohort
 - effects of family and work obligations of younger patient
 - possible effects of poorer quality of patient-provider communications

Conclusions (Continued)

10. Interventions to support behavior change in gestational diabetes and increase postpartum screening are promising and needed.
11. Greater system-level attention to weight management/lifestyle interventions in patients with type 2 may be critical to improving outcomes.

TRIAD Achievements

- First multi-agency collaboration in diabetes multi-disciplinary translation research: CDC, NIDDK, VA.
- Major training ground for junior and minority public health researchers.
- > 100 investigators plus several contractors.
- Major influence on health policy and public health response to diabetes:
 - 41 peer-reviewed articles published or in press, with dozens more in preparation.
 - Has influenced disease management practices in participating managed care health plans.

Next Steps

- Continued use of TRIAD data
 - TRIAD Legacy Studies
 - NIDDK R18 Mechanism

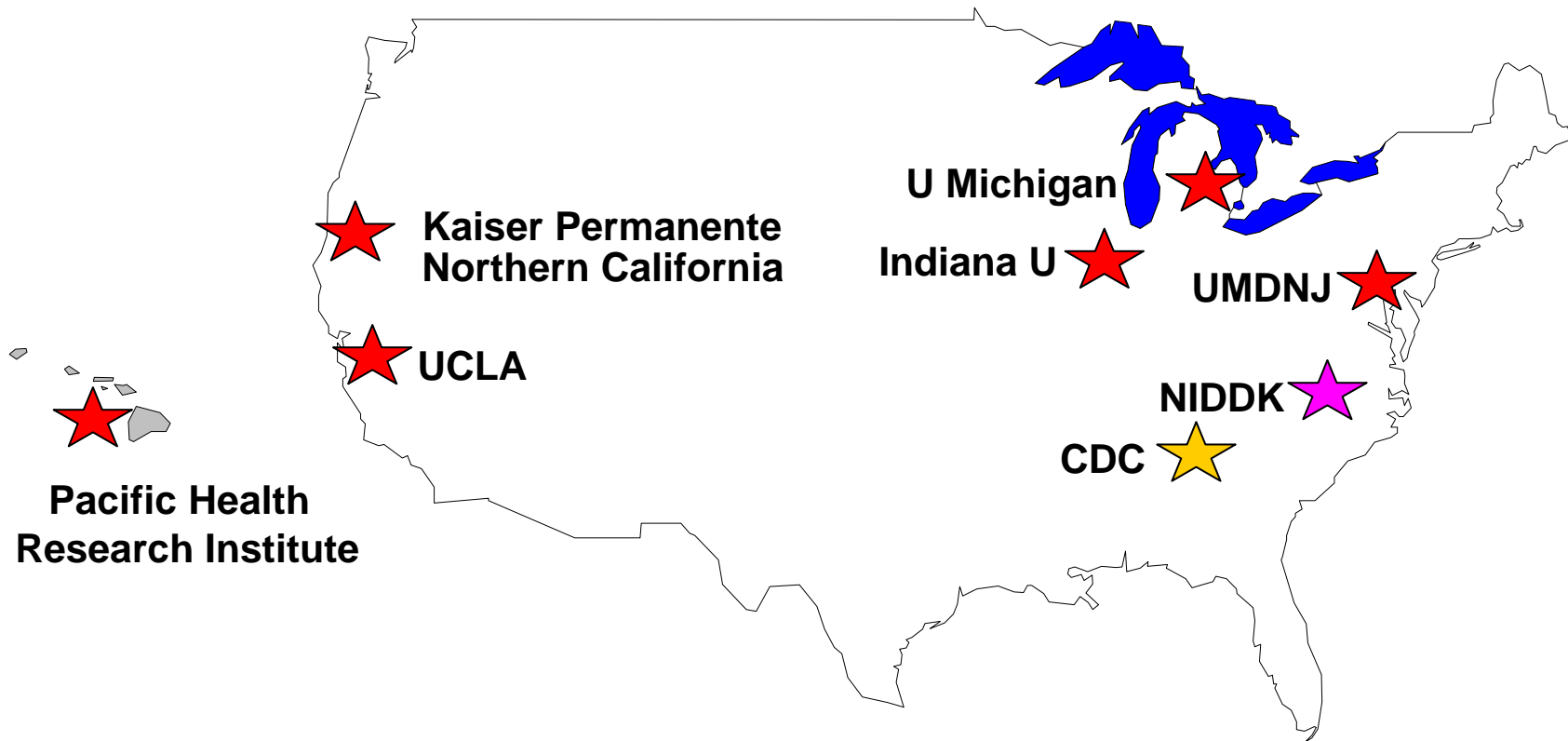
Future Needs

- New mechanisms to study innovations in systems and organizations of care.
- Research platforms that permit efficient study of natural experiments.
- Studies of health system-patient interactions.
- Application of health services research to primary prevention and behavioral change.
- Influence and adaptation of electronic medical records into health services research.

Appendix A


Additional slides that may be of use or
can replace slides in the main body

TRIAD Sites and Sponsoring Agencies



 Translational Research Centers

 Centers for Disease Control - Sponsor

 National Institute of Digestive and Diabetes and Kidney Disorders - Sponsor

TRIAD Rationale and Objectives

- Rationale: Effective interventions for preventing diabetes complications are not optimally implemented and are missed opportunities to reduce the burden of diabetes.
- Objective: To determine the system-level disease management strategies and patient factors that influence the processes and outcomes of diabetes care, with special attention to vulnerable populations.

Prevalence (%) of Diagnosed and Undiagnosed Diabetes and Impaired Fasting Glucose (IFG) Among Adults, Aged 65+ years*



15.8% Diagnosed

6.0% Undiagnosed

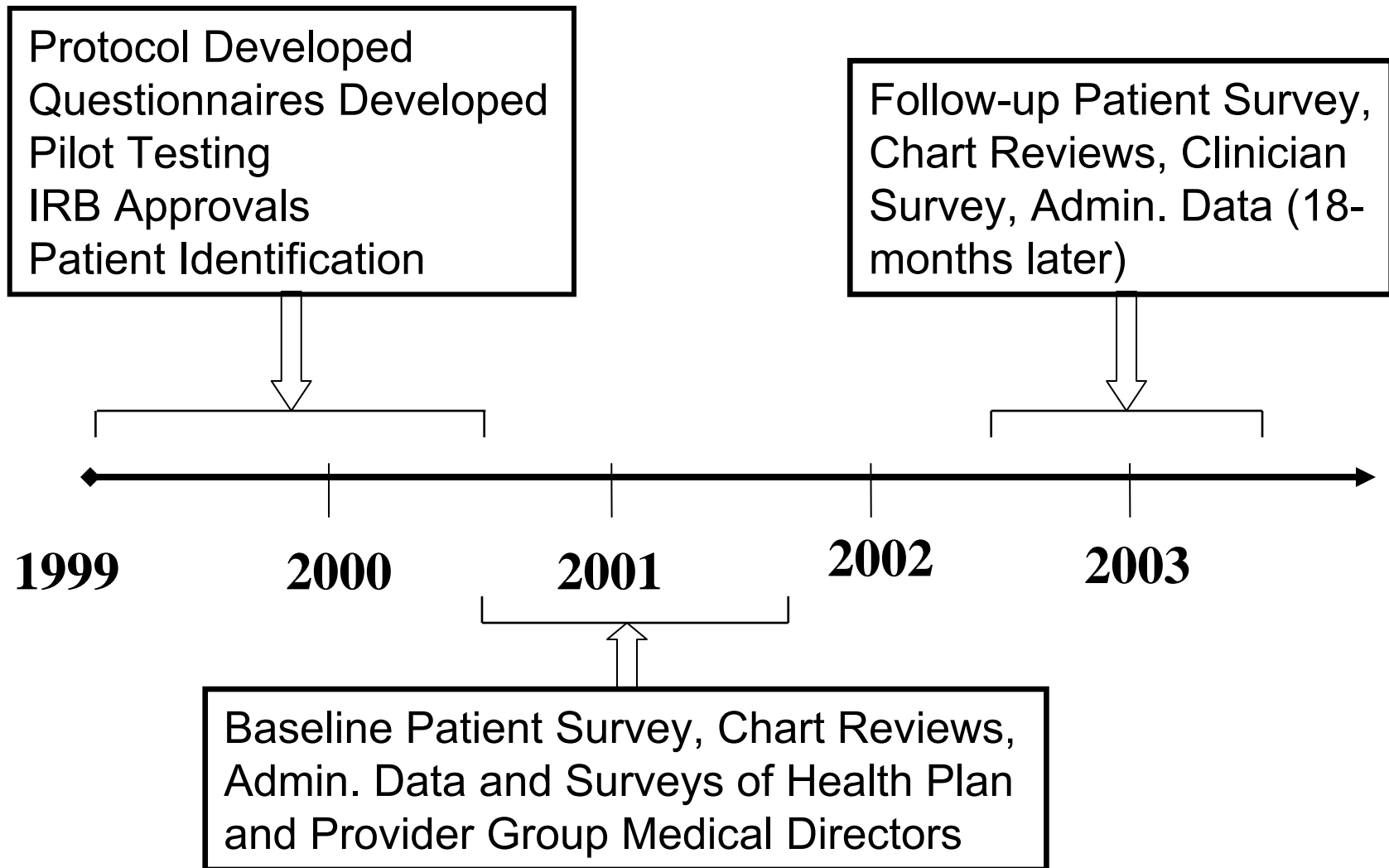
39.5% IFG

38.7% All others

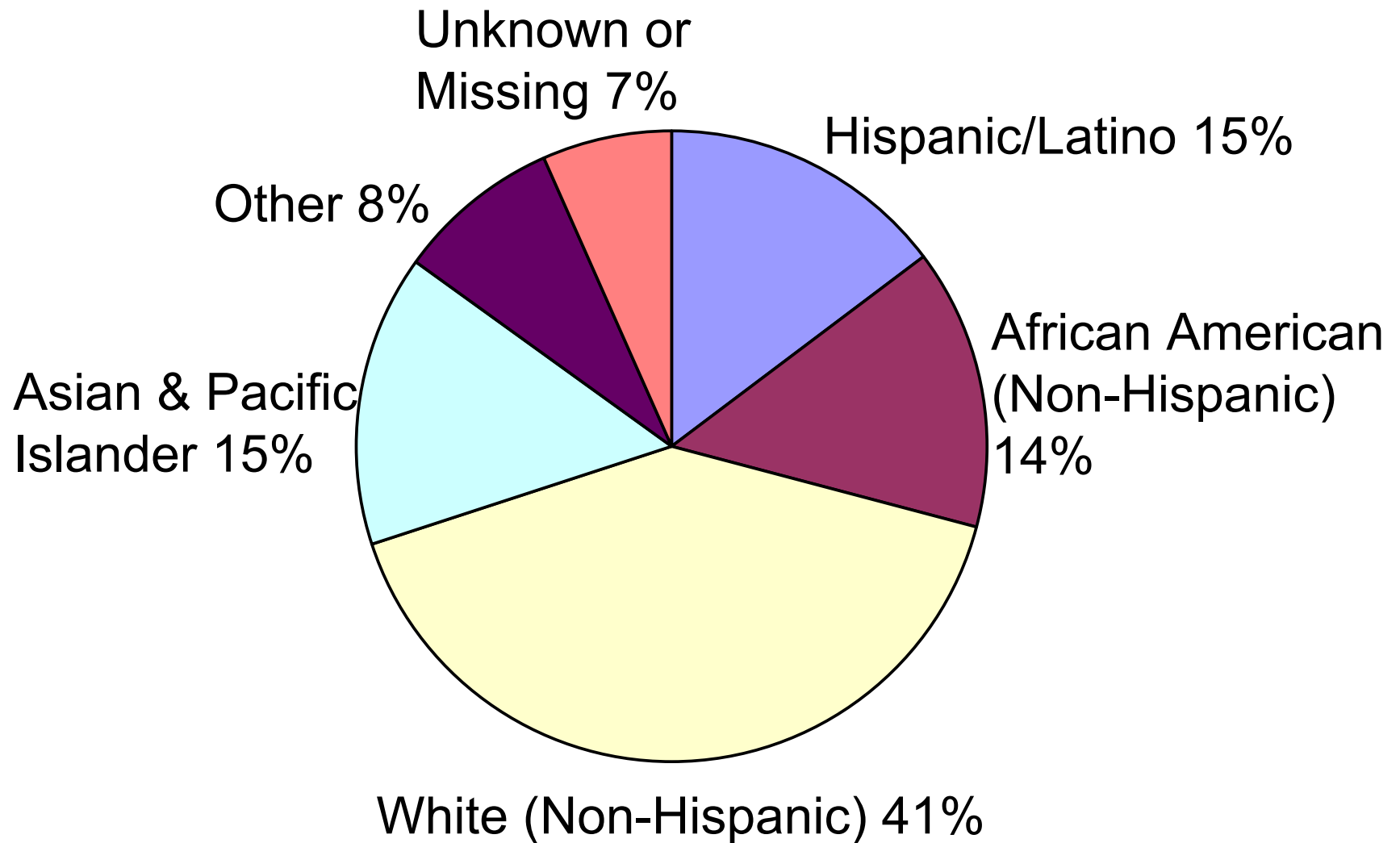
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* NHANES 1999-2002, Cowie CC et al.. *Diabetes Care* 29(6):1263-1268, 2006

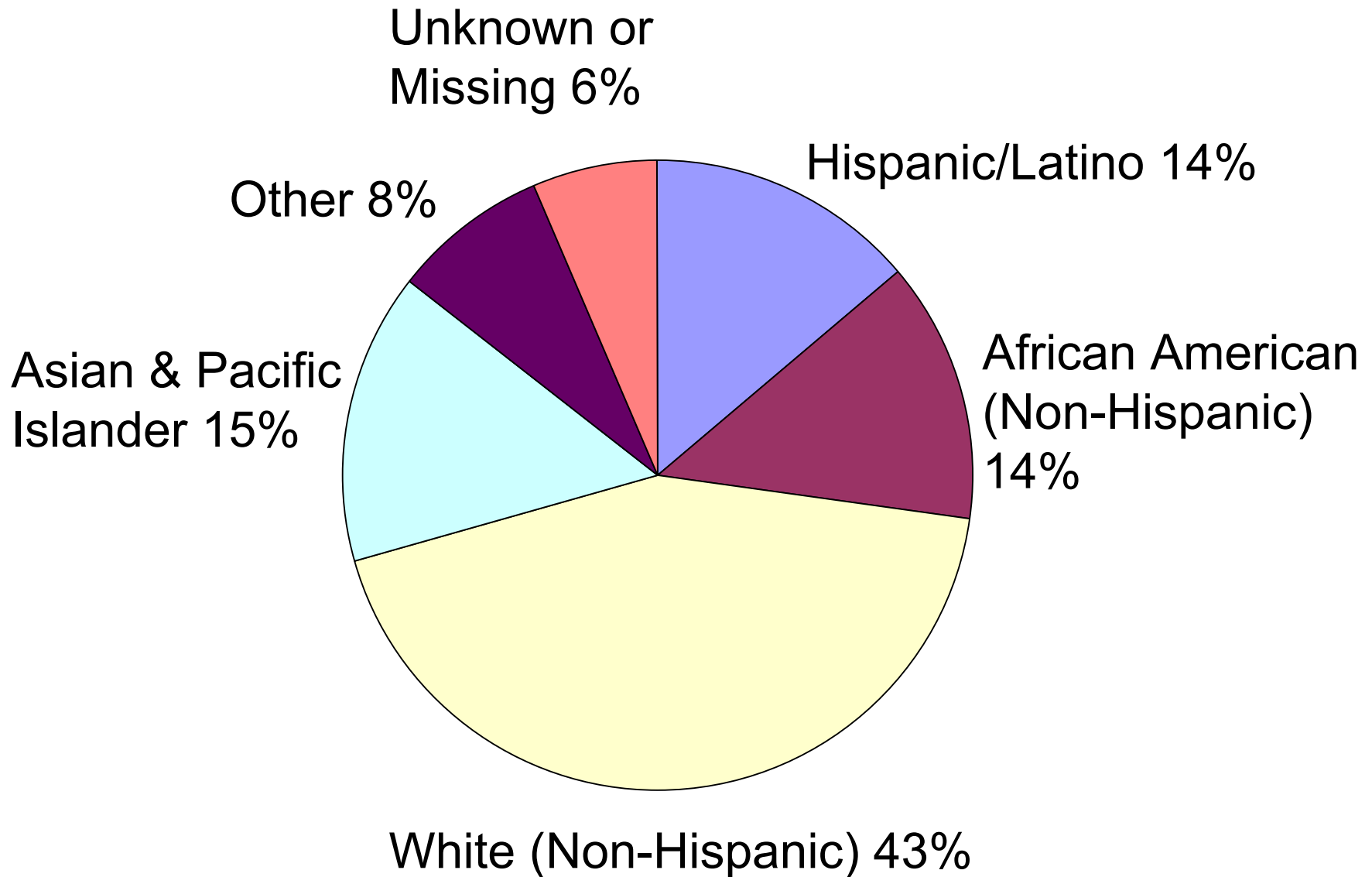
TRIAD I Timeline



TRIAD I Sample by Ethnicity at Time 2



TRIAD I Sample by Ethnicity at Time 3



Conclusions of TRIAD I

- Provider groups with the greatest intensity of diabetes care management and use of feedback to MDs had higher predicted percent compliance with 6 of the 7 process of care indicators.
- More intensive use of DM registries and MD reminders improved predicted compliance with 3 of the 7 process indicators.
- TRIAD has limited power to look at the impact of the same clinical care strategies implemented at the HP level.

Conclusions of TRIAD I (Cont.)

- Although the intensity of disease management was strongly related to several processes of care, it was not associated with lower levels of any CVD risk factor, nor with more appropriate treatment for elevated levels of any risk factor.
- Disease management programs may need to address CVD risk factor management more directly and intensively.

TRIAD Clinical Findings

- Pain among minorities with diabetes. Under review 2007
 - Moderate to extreme pain was present in 3 out of 4 patients
 - Those with pain were younger, more obese, more depressed, and reported poorer health status
- In a report that examined predictors of sustained walking over time, new pain was associated with stopping a walking program. Duru et al., 2007

These reports and others in TRIAD that have examined correlates of depression among those with diabetes support the need for the development and evaluation of system, provider, or patient level interventions to improve the detection and treatment of pain among persons with diabetes.

TRIAD Clinical Findings (cont.)

- Sub-optimal use of proteinuria screening and initiation of preventive treatments for CRF
- Gestational diabetes mellitus, prevalence and correlates of postpartum screening, costs per case of DM detected, and risk perception for DM
- Socio-demographic correlates of obesity and weight change in TRIAD
- Relationship between weight change and cardiovascular risk factors
- Poorer control of CVD risk factors among women with DM

Summary

- Reports in TRIAD have contributed to a better understanding of both the immutable and mutable factors that are driving poor outcomes in diabetes
- The mutable factors point to a number of potential system, provider, and patient level interventions that could improve intermediate outcomes and reduce health disparities – these need to be designed and tested in partnership with health plans and providers

Summary (Continued)

- TRIAD continues to demonstrate the value of carefully constructed observational studies, many with quasi-experimental designs, for tracking the influence of organizational structure and the “natural experiments” at the multiple levels that occur in real world health care settings

Summary (Continued)

- TRIAD has also provided the needed data to study a number of important clinical and methodological questions that inform both the practice of medicine and observational research.
- TRIAD has provided the needed support and data to advance the careers of many entry level researchers who have conducted the vast majority of analyses under the direction of senior researchers both at the TRCs and CDC.

Key Predictors of Cost-Related Medication Underuse (Tseng et al., Diabetes Care, 2008)

	%
Monthly out of pocket costs	
< \$50	9
\$50 to 100	14
\$100 to 149	20
> \$150	29
Age: 18-44	23
45-64	15
> 64	6
Income: <25k	15
25 – 49k	12
> 50k	5

TRIAD Conceptual Model for System Factors

