The School of Rural Public Health Texas A&M University System Health Science Center

Southwest Rural Health Research Center

CHRONIC DISEASE MANAGEMENT IN RURAL AREAS - 2003-2004 REPORT: RURAL AND URBAN DIFFERENCES IN MANAGED MEDICARE AND MEDICAID PROGRAMS

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TABLE OF CONTENTS

LIST OF FIGURES & TABLES

CHRONIC DISEASE MANAGEMENT IN RURAL AREAS - 2003-2004:
RURAL AND URBAN DIFFERENCES IN
MANAGED MEDICARE AND MEDICAID PROGRAMS

I. Executive Summary

Introduction:

This is the 3rd year report of a project reflecting the work of researchers, clinicians, clinic administrators, and clinic staff examining chronic disease management efforts in rural areas. This report focuses on rural chronic disease management efforts within *Medicare* and *Medicaid* populations.

Beginning in the Fall of 2001, six health systems offering disease management in rural and underserved patient populations agreed to collaborate with the Southwest Rural Health Research Center (SRHRC) to examine organizational challenges to implementing DM and patient level outcomes to DM efforts. These health systems were: **Carle Clinic, Marshfield Clinic, Scott & White Clinic, Geisinger Clinic**, **The Health Plan of the Upper Ohio Valley**, and **St. Elizabeth of Hungary Health Clinic for the uninsured**. The first four are multi-specialty-based integrated delivery systems serving significant rural populations, the fifth is an IPA-model HMO serving primarily a rural region extending into three states, and the sixth is nonprofit clinic serving the rural reaches of Tucson, Arizona. All of these health systems rely on national standards and quality indicators as their own benchmarks. Outcomes in the DM program for the uninsured that we studied differed very little from the private DM programs. Positive findings in terms of measuring clinical indicators for diabetes such as HgbA1c, LDL levels, blood pressure, urine micro-protein, as well as foot and eye exams, at appropriate times could be observed across all systems in our study.

This research provides further evidence that the chronic disease management model can be implemented in rural populations among uninsured, private pay, Medicare patients, and Medicaid patients with success. Those systems that are successfully carrying out DM programs have “bought-in” to the team approach to patient care, believe that DM will save money for the systems in the long-run, and tend to rely more on nurses for monitoring, education, support and delivery of services.

Rural and Urban Differences in Managed Medicare and Medicaid Programs

The passage of the *Medicare Modernization Act* (“MMA”), (H.R. 1, Title VII, Subtitle C, §721), on December 8, 2003, opened the door to fundamental changes in Medicare’s Fee-For-Service (“*FFS*”) program. While the prescription drug provisions generated significant public interest and policy debate, provisions relating to the chronic care improvement (“*CCI*”) directives passed through relatively unnoticed. Nonetheless, the *CCI* provisions portend fundamental changes to Medicare *FFS* through the initiation, development, and testing of chronic care improvement programs for chronically ill Medicare beneficiaries. Prominent among the *CCI* provisions, is a solicitation for pilot programs testing provider incentives for instituting chronic disease management (DM) guidelines in the care of Medicare beneficiaries. The intention of the drafters of the *CCI* provisions are to eventually extend *CCI* benefits to the 10 million Medicare and 25.2 million Medicaid beneficiaries in the United States (Fried, Prager, Mackay & Xia, 2003) many of whom have chronic illnesses amenable to disease management.

Supporters of the *CCI* disease management provisions express optimism that adding chronic disease management incentives to Medicare FFS will improve the quality of services for Medicare beneficiaries and reduce overall costs for the program by improving health. The current focus by Medicare and state Medicaid programs on disease management as a cost-containment tool is both timely and imperative. According to the Health Policy Studies Division of the National Governor's Association an estimated 78 percent of the nation's total health care expenditures (and 80 percent of total Medicaid expenditures) are spent on treatment for chronic diseases or conditions (NGA, 2003; Johns Hopkins, 2002). The American Diabetes Association estimates that direct medical and indirect expenditures attributable to diabetes in 2002 accounted for 19 percent of the total healthcare budget in the U.S. and is estimated to be $132 billion (ADA, 2003).

Many Medicare and Medicaid *managed* care programs now commonly employ chronic disease management in their care of insureds (Wheatley, 2001), and over 24 states now have some form of chronic disease management as a contractual requirement in Medicaid programs. However, it is not clear that chronic disease management can be successfully implemented in fee-for-service Medicare or Medicaid populations. Rural and underserved populations are primarily fee-for-service with many additional challenges that go well beyond recognized, conventional concerns such as financing, controlling costs and ensuring quality of care. Given the challenges of providing disease management services in these populations, the next stage of our analyses examined rural and urban DM outcomes in Medicare and Medicaid populations.

The Year-3 component of the project examined rural and urban outcomes of patients identified as Medicare or Medicaid from Carle Clinic and Scott and White Clinic, both of which offer diabetes disease management to Medicare beneficiaries, and Florida's Medicaid Managed Care, which has provided DM data on both diabetes DM and congestive heart failure ("CHF") DM programs. All three-health systems have both urban and rural beneficiaries enrolled in the diabetes DM program allowing for rural-urban comparisons in delivery of diabetes DM services, clinical outcomes and financial outcomes. The analyses were limited to diabetes outcomes within health plans serving both Medicare and non-Medicare beneficiaries in rural and urban areas. An analysis of Medicaid claims data for diabetes DM programs in the State of Florida provided an additional perspective on possible rural and urban differences in DM.

Key Year – 3 findings include the following:

1. Improvement of hemoglobinA1c (HbA1c) and LDL levels in both Medicare and Non-Medicare patients enrolled in the two systems' diabetes DM programs did not vary from baseline to Year-2.
2. There were observed rural-urban differences in mean HbA1c levels and LDL levels from baseline to Year-2, however, these observations were significant only for LDL levels.
3. "Control" of hemoglobinA1c (HbA1c) did not vary significantly between rural and urban patients or between Medicare and non-Medicare patients among the two systems' populations.
4. Rural patients were significantly less likely than urban patients of both systems to be considered in "control" for low-density lipids ("LDL"); but there were no

statistically significant differences between Medicare and non-Medicare patients in this regard.

5. Analysis of Florida's Medicaid Diabetes DM data showed that rural patients enrolled in Medicaid DM were less likely than urban patients to receive provider services or medical clinic services for diabetes DM. However, rural Medicaid patients enrolled in Florida's diabetes DM program were more likely than their counterparts in urban areas to receive pharmacy services, home and community services, and public and private transportation assistance in accessing needed services.

The explanation for the similarities and differences in the analyses of Medicare patients is not clear-cut. First, Carle Clinic and Scott & White Clinic offer evidence of diabetes DM's contribution to increased "control" of hemoglobinA2c (HbA1c) and LDL (low density lipids[1]) over a two-year time period. The fact that DM-associated "control" of HbA1c does not vary according to rurality or Medicare status of a population suggests that this element of control can be attained with some success regardless of geographic setting or age (with Medicare being an older population). However, the finding that LDL is less "controlled" in rural populations than in urban populations may reflect greater patient access problems in monitoring and controlling this indicator in rural settings. It is possible, too, that it may reflect less healthy diet or exercise habits among rural residents. In sum, rural residents may have less access to primary care offices or medical labs for more frequent monitoring of LDL and less access to nutritional counseling and support afforded in more urban settings.

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[1] LDL (Low Density Lipids) measure total Cholesterol – HDL (high density lipids). LDL reflects "bad" lipids or fats in the bloodstream. High levels (> 100) are considered one of the risk factors of cardiovascular disease.

Finally, the Florida Medicaid data reinforces the notion that rural patients may suffer from provider access challenges more so than urban patients. Rural patients enrolled in Medicaid DM were less likely than urban patients to have claims for provider services, home health, or medical clinic services; suggesting less rural access to these providers. Florida's rural Medicaid patients enrolled in Florida's diabetes DM program, in contrast, were more likely than patients in urban areas to receive pharmacy service, home and community services, and to have a claim for public and private transportation. This pattern would suggest that limited access to clinics and other provider services in rural areas may contribute to greater difficulty in gaining control over diabetes management.

Collectively these findings suggest that disease management policies and programs targeting Medicare and Medicaid populations should take into account possible barriers and constraints found in rural populations and settings. And, more specific to the findings reported here, attention should focus on access to services that can contribute more directly to control of LDL in diabetes DM. Additional investigation might be given to increasing access to long-term nutritional and exercise support in rural settings that might help to address rural disparities in control of LDL. Similarly, continued study of access to primary care providers for Medicaid DM populations and other DM populations in rural areas is needed to determine whether any such access differentials might account for disparities in LDL control.

Chronic Disease Management in Rural Areas- 2003-2004: Rural and Urban Differences in Managed Medicare and Medicaid Programs

II. INTRODUCTION

Key provisions of the recently enacted *Medicare Modernization Act* (H.R. 1, Title VII, Subtitle C, §721) target disease management ("DM") in the fee-for-service Medicare population. The passage of the Medicare Modernization Act on December 8, 2003, opened the door to fundamental changes to Medicare's Fee-For-Service ("FFS") program. While the prescription drug provisions generated significant public interest and policy debate, provisions relating to the chronic care improvement (CCI) directives passed through relatively unnoticed. Nonetheless, the CCI provisions portend important changes to Medicare FFS through the initiation, development, and testing of chronic care improvement programs for chronically ill Medicare beneficiaries.[2]

Prominent among the *CCI* provisions, are changes calling for pilot programs in chronic care management in Medicare's Fee-For-Service ("FFS") that include provider incentives encouraging providers to partner with patients in chronic disease management. The target population of the CCI programs may eventually extend to the 10 million Medicare and 25.2 million Medicaid beneficiaries in the United States (Fried, Prager, Mackay & Xia, 2003) many of whom have chronic illnesses amenable to disease management.

[2] A description of the Chronic Care Improvement Program may be found at the CMS web site under subtitle C, see: http://www.cms.hhs.gov/mmu/hr1/PL108-173summary.asp#tVIIsubtitleC. The CCI provisions require the Secretary of DHHS to phase in chronic care improvement programs in traditional fee-for-service. Programs must be designed to improve clinical quality and beneficiary satisfaction, as well as achieve spending targets for expenditures for targeted eligible individuals with chronic conditions. CCI programs must implement a screening process, provide each individual with a individualized, goal-oriented care management plan, and carry out the CCI plan while providing other chronic care improvement services. Each individual patient shall be provided a designated point of contact, self-care education, physician and health care provider chronic care education, implement monitoring technologies, provide information about hospice services, pain and palliative care and end-of-life care.

Supporters of MMA's disease management provisions hope that incentives in Medicare FFS for chronic disease management incentives will improve the quality of services for Medicare beneficiaries and reduce overall program costs by better maintaining the health of the chronically ill and improving health.

This report examines chronic disease management outcomes in two health systems that serve Medicare and other populations and service use among Medicaid populations served by Florida's DM program. Special attention to variations in outcomes associated with rural and urban populations may point to needed policy and program adjustments to better meet the needs of the rural chronically ill.

II.1 Background

In the face of escalating healthcare costs for chronic disease care, Medicare and state Medicaid programs have turned to chronic disease management methods as a pro-active, population-based, approach to managing chronic diseases and ultimately controlling costs (Crippen, 2002; Johnson, 2003). Controlling and managing the effects of chronic diseases in a cost effective manner, is a significant national policy need (Ricketts, Johnson-Webb, & Randolph, 1999; Schur, Franco, 1999; Mueller, Ortega, Parket, & Askenaze, 1999).

DM offers the potential for realization of significant reduction in cost of caring for the chronically ill. Recent CDC estimates of the direct and indirect costs associated with diabetes project that diabetes alone is responsible for nearly $100 billion in health-related costs in the United States per year (CDC, 2003). Similarly, health costs associated with cardiovascular disease are estimated at approximately $300 billion per year (CDC, 2003). The current focus by Medicare and state Medicaid programs on disease management as a cost-containment tool is both timely and necessary in light of the staggering increase in chronic, disability producing conditions in the adult population—especially among minority and underserved populations (Ricketts, Johnson-Webb, & Randolph, 1999; Schur, Franco, 1999; Mueller, Ortega, Parket, & Askenaze, 1999).

The Health Policy Studies Division of the National Governor's Association estimates that 78 percent of the nation's total health care expenditures (and 80 percent of total Medicaid expenditures) are for chronic diseases or conditions (NGA, 2003; Johns Hopkins, 2002). The American Diabetes Association estimates that direct medical and indirect expenditures attributable to diabetes in 2002 were $132 billion (ADA, 2003). Expenditures for direct medical expenses totaled $91.8 billion and included an enormous price tag of $23.2 billion for diabetes care, $24.6 billion for chronic complications resulting from diabetes, and another $44.1 billion for associated general chronic medical conditions (ADA, 2003). Champions of disease management programs in managed care organizations (MCOs) or accrediting organizations have shown that patients and providers who follow DM guidelines in their care of patients improve health and reduce costs for health plans. In order to encourage adherence to DM guidelines, Medicare programs are offering such inducements as higher capitated payments to insurers and providers willing to provide DM programs for beneficiaries with chronic conditions (DHHS, 2003). However, it is not yet clear that chronic disease management can be effectively carried out in older, Medicare-age patients with chronic conditions.

Prior studies have demonstrated that DM efforts in urban or suburban areas result in substantial savings for health plans and over-all improved health of beneficiaries. At the same time, previous research has demonstrated that there are unique challenges to implementing disease management programs in rural areas (Zuniga, Gamm & Bolin, 2003). Essential organizational support and components of DM must be in place in order to achieve successful outcomes (Zuniga, Gamm, & Bolin, 2003). These components include care by specialized providers, clinical practice guidelines, provider education and orientation, identification of population at risk and appropriate screening, case management, home visits, utilization management, and feedback to providers as well as DM patients (Zuniga, Gamm, & Bolin, 2003).

Health professionals that serve rural and urban populations have observed several elements of rural disadvantage, including isolated elderly who lack transportation, reduced availability of ancillary services, variation in medical practice patterns of certain rural physicians, and patient dependence on local physicians who are unwilling to "share control over the patient with DM professionals," such as nurse case-managers (Bolin, Gamm & Zuniga, 2003a,b).

II.2 National and State Rural Health Policy

Present estimates suggest that the cost of providing care for persons with chronic illnesses is a large and increasing burden for state and federal health budgets NGA, 2003; MedPac, 2004). Controlling the effects of chronic illnesses in a cost effective manner, is a significant national policy need. Chronic DM offers Medicare and State Medicaid programs the potential for improvement in the overall health of individuals with chronic diseases such as Congestive Heart Failure (CHF), Diabetes, Chronic Obstructive Pulmonary Disease (COPD) and Asthma, while, at the same time reducing total costs. The current focus by Medicare and Medicaid programs on chronic DM as a cost-containment tool is both timely and necessary in light of the staggering increase in chronic, disability producing conditions in the adult population—especially among minority and underserved populations (CMS, 2003, Crippen, 2002).

Rural healthcare providers may find compliance with *CCI's* disease management initiatives difficult because healthcare delivery in rural and underserved populations presents many challenges that go well beyond recognized, conventional concerns such as financing, controlling costs and ensuring quality of care (Bolin, Gamm and Zuniga, 2003a). Challenges include travel barriers, fewer providers, lack of ancillary services, and seasonal employment with unpredictable insurance coverage.

In order to evaluate rural DM efforts, we examine data from three DM programs, two providing DM services at Carle Clinic of Champaign-Urbana Illinois, Scott & White Clinic of Temple, Texas to Medicare-age populations in rural and urban areas, and the Florida Medicaid DM program serving Medicaid patients in rural and urban Florida. Data from these programs allowed us to determine if there are significant differences in diabetes DM outcomes for rural and urban patients.

III. Project Description and Research Goals

III.1 Research Objective:

The research objectives are the evaluation of chronic disease management outcomes in Medicare populations in comparison to privately insured populations and the evaluation of urban-rural differences in patient-level clinical outcomes of DM programs serving Medicare and/or Medicaid populations.

III.2 Research Questions & Hypotheses:

1. What differences in outcomes of diabetes DM can be observed among patients insured through Medicare or Medicaid and those who are privately insured?

   H1: Medicare patients enrolled in diabetes DM will reflect significantly lower degrees of control of diabetes as measured by HbA1c and LDL than do persons with employer-sponsored insurance who are enrolled in diabetes DM.

2. Are there urban-rural differences in outcomes of diabetes DM that can be observed among Medicare patients and privately insured patients?

   H2: Rural Medicare patients enrolled and participating in diabetes disease management will demonstrate higher levels of HbA1c and LDL than urban Medicare patients.

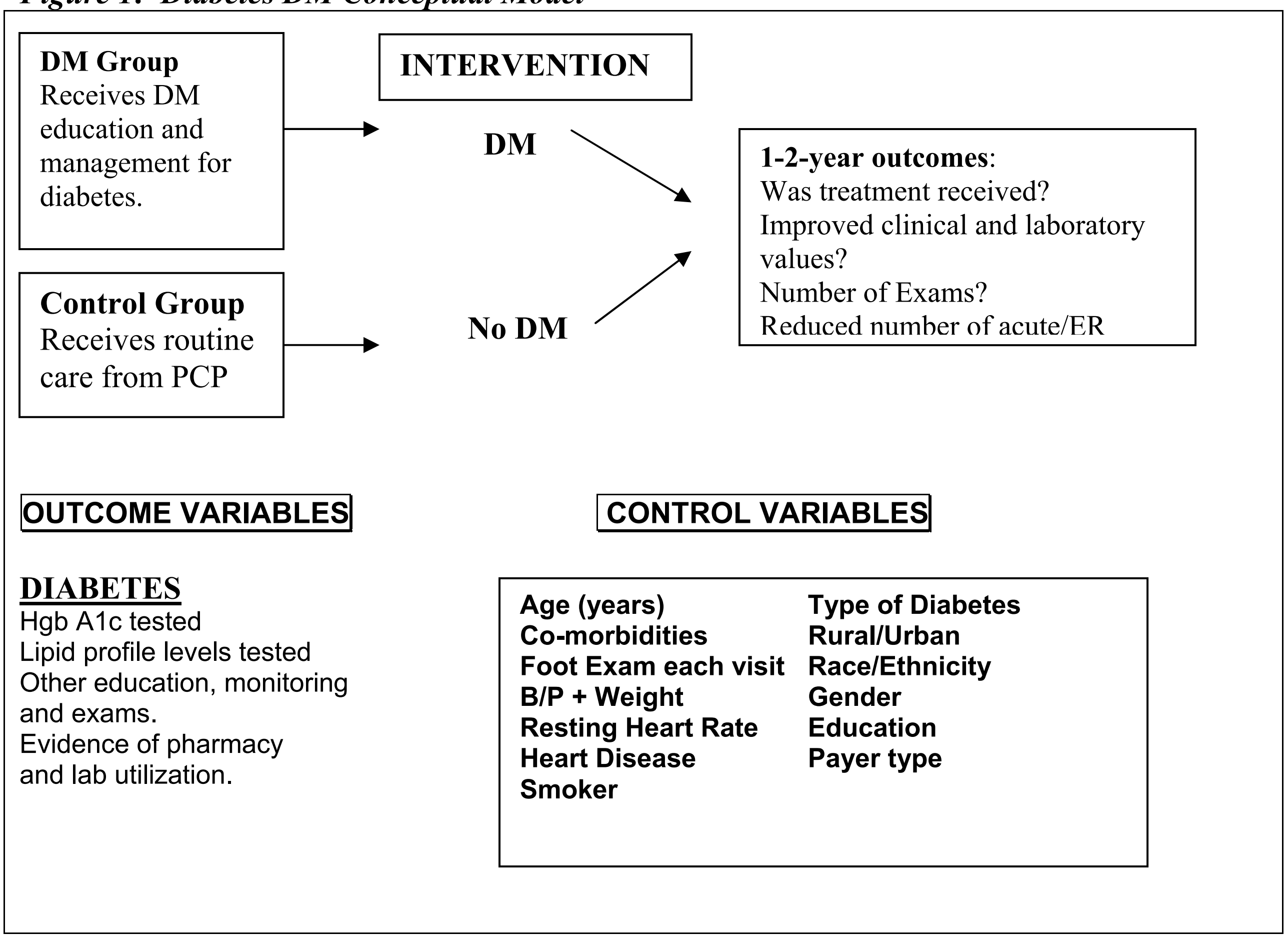
3. Are there urban-rural differences in services utilized by Medicaid DM patients in a state Medicaid program?

   H3: Rural Medicaid patients evidence lower levels of utilization of primary care services that might support DM than urban Medicaid patients.

IV. Methods and Analysis

Figure 1 provides the conceptual model for analyzing the data relying on both descriptive statistics and more complex statistical comparisons. While the model contains a number of independent variables, we were not able to include all variables that would ideally be included in an analysis because of the lack of data. Where possible, Chi-square comparisons with significance tests were made.

Figure 1: Diabetes DM Conceptual Model



V. Results

The following analyses are based on patient-level diabetes DM data of patients insured privately or through Medicare or Medicaid insurance. Two programs, Carle Clinic of Champaign-Urbana, Illinois, and Scott & White Clinic of Central Texas serve both Medicare and persons insured privately or through employment. These two programs support tests of the first two hypotheses. The State of Florida provided Medicaid managed care claims data from 1998 - 2000. The latter site supports tests relating only to the third hypothesis. The results from each program will be discussed separately.

V.1 Carle Clinic of Illinois

Carle Clinic provided on-site diabetes data analysis for its diabetes patients (N = 5,320) enrolled in the Diabetic Registry. Those enrolled included both Medicare and Non-Medicare insured, and those enrolled in both HMO and fee-for-service programs. Forty percent (N = 2,228) were classified as living in rural counties, and 60 percent (N = 3,202) were designated as residing in urban counties. The sample consisted of 2,766 females and 2,554 males, and all patients in the sample have been diagnosed with diabetes. Analysis segmented the patient population into rural and urban cohorts, based on practice location (clinic site) of their primary care physician (PCP), to examine two primary programs: the percentage of patients who were in (1) therapeutic glycemic control (HbA_{1c}), and (2) therapeutic lipid control (LDL cholesterol) at three different time periods.

Carle's Study Population

Carle's diabetes registry population met the following criteria:

1. Continuously enrolled in Carle's Diabetes registry from October 2000 through March 2003 (30 months);

2. Had a Carle Clinic Association (CCA) physician as their PCP (primary care practitioner) during the study period;

3. Were at least 19 years of age; and

4. Used the Carle healthcare system for their lab work.

The following information was available from the diabetes registry for each patient: age, gender, primary care provider ("PCP") type (adult medicine/family practice/specialist), PCP clinic location, primary insurance coverage (managed care/HMO; Medicare; other), date first placed in Diabetes registry, and HbA_{1c} and LDL values.

Rural/Urban Designation

In order to segment patients into rural and urban populations, the clinic locations of the patient's PCP were designated as rural or urban, according to which county in Illinois the clinic was located using Illinois Department of Public Health classifications for rural and urban codes. The designation of rural or urban counties used are unique to the Illinois DPH for the purpose of collecting and reporting statewide or county information and are not used/endorsed by ORHP. This resulted in the following:

- 7 Carle Clinic Association (CCA) clinics designated as rural; N = 2,118 patients. (6 of the 7 rural clinics are located in communities of less than 20,000; the 7th is designated as a rural health clinic and located in a community of 30,000).
- 4 CCA clinics designated as urban; N = 3,202 patients.

Outcome Variables

There were two primary study outcomes, **glycemic control** (HbA_{1c}) and **lipid control** (LDL cholesterol). Glycemic control was defined as those patients who had an HbA_{1c} value that was < 7.0. A value of 7.0 or greater or a *missing value* was considered *not* in control. Lipid control was defined as those patients who had an LDL value that was <100. A value of 100 or greater or a *missing value* was considered *not* in control. Secondary outcomes included mean differences in HbA_{1c} and LDL values.

Three evaluation periods were used in the analysis: (1) Baseline (October 2000 through March 2001); (2) Year 1 (October 2001 through March 2002); and (3) Year 2 (October 2002 through March 2003). Comparisons were made between: (1) Baseline and Year 1 outcomes (Year 1); (2) Year 1 and Year 2 outcomes (Year 2); and (3) Baseline and Year 2 outcomes (Total 2 Years).

Statistical Analysis

The statistical analyses began with analyzing baseline characteristics of urban and rural populations using X^2 for categorical variables and the *t* test for continuous variables. Next logistic regression was used to test the proportion of HbA_{1c} and LDL control between the two groups, controlling for age, gender (female), PCP type, insurance (HMO primary/Medicare), time in the registry (years) and the preceding value of the outcome variable. (The baseline HbA_{1c} and LDL value was used to adjust for Year 1 outcomes, Year 1 values were used to adjust for Year 2 outcomes, and baseline values were used to adjust for Total 2 Years). General linear modeling (GLM) was used to test the mean HbA_{1c} and LDL values between the two groups controlling for the same variables listed above. Patients were included in the analyses only if they had a lab value at each evaluation point.

Study Population Characteristics

The baseline characteristics of Carle's diabetic study population are listed in Table 1. Sixty percent (60%) of Carle Clinic's Diabetic Registry patient population was designated as urban and 40 percent is designated rural.

Table 1. Carle's Diabetes Disease Management Program, Baseline Characteristics*

Characteristics	Rural Patients	Urban Patients	*P* Value
N Patients	2,118	3,202	
% of Total Population	40	60	
Mean Age, y ± SD	62.6 ± 13.4	62.2 ± 14.2	0.318
Female Sex, %	52.4	51.6	0.575
Carle Clinic Locations, n (%):			
Bloomington		982 (31)	
Champaign		531 (17)	
Danville	909 (43)		
Effingham	40 (2)		
Mahomet	290 (14)		
Mattoon	347 (16)		
Monticello	104 (5)		
Rantoul	284 (13)		
SeUr		152 (5)	
Tuscola	144 (7)		
Urbana		1,537 (48)	
PCP Specialty, %:			
Adult Medicine	37.9	51.7	**<.001**
Family Practice	61.9	34.4	**<.001**
Specialist	0.2	14.0	**<.001**
Insurance Type, %:			
HMO Primary	30.6	33.9	**<.001**
Medicare Primary	**48.2**	**47.6**	**0.695**
Time in Registry, y ± SD	4.7 ± 1.3	4.9 ± 1.2	**<.001**

Notes:
y = years; SD = standard deviation
% = percentage
* The designation of rural or urban counties used are unique to the Illinois DPH for the purpose of collecting and reporting statewide or county information and are not used/endorsed by ORHP.

The average patient age in Carle's diabetic registry was approximately 62 years old with just over 50% female. A higher percentage of urban patients (34 percent) had managed care as their primary insurance source compared to their rural counterparts (31 percent; $p<.001$). A higher percentage of urban patients had an adult medicine PCP (51.7%) compared to rural patients (37.9%; $p<.001$).

Unadjusted Study Outcomes

Table 2 lists the unadjusted outcomes by evaluation period with results for the entire patient population by rural/urban status shown at the top part of the table. The middle section of Table 2 shows outcomes for Medicare vs. non-Medicare patients by rural/urban status.

Table 2. Carle's Unadjusted Outcomes by Study Period

Outcome	Baseline (Apr 01)		Year 1 (Apr 02)		Year 2 (Apr 03)	
	Rural	Urban	Rural	Urban	Rural	Urban
N Patients	2,118	3,202	2,118	3,202	2,118	3,202
HbA_{1c} in control (<7.0), %	22.0	21.5	29.5	28.3	31.2	32.4
N Patients w/ HbA_{1c} value	1,497	2,270	1,501	2,291	1,397	2,253
Mean HbA_{1c} value, + SD	7.9 + 1.7	7.9 + .6	7.4 + .4	7.5 + 1.3	7.3 + 1.3	7.3 + 1.3
LDL in control (<100), %	20.4	25.3*	22.6	28.8*	24.9	30.9*
N Patients w/ LDL value	1,119	1,930	1,162	2,034	1,284	2,231
Mean LDL value, + SD	112 + 35	108 + 31*	109 + 3	106 + 31*	110 + 32	107 + 30*
Medicare vs. Non-Medicare						
N Medicare Patients	1,021	1,525	1,021	1,525	1,021	1,525
N Non-Medicare Patients	1,097	1,677	1,097	1,677	1,097	1,677
Medicare Patients:						
HbA_{1c} in control (<7.0), %	25.3	24.9	34.9	32.5	38.0	39.3
N Patients w/ HbA_{1c} value	740	1,085	748	1,119	699	1,110
Mean HbA_{1c} value, + SD	7.6 + 1.5	7.6 + 1.3	7.2 + .1	7.2 + 1.0	7.0 + 1.1	7.0 + 1.0
LDL in control (<100), %	22.0	29.8	24.5	32.6	26.0	32.7
N Patients w/ LDL value	540	988	567	1,010	639	1,092
Mean LDL value, + SD	110 + 36	104 + 30	108 + 35	104 + 30	108 + 32	106 + 30
Non-Medicare Patients:						
HbA_{1c} in control (<7.0), %	18.9	18.5	24.5	24.4	24.9	26.2
N Patients w/ HbA_{1c} value	757	1,185	753	1,172	698	1,143
Mean HbA_{1c} value, + SD	8.2 + 1.9	8.1 + 1.8	7.7 + .5	7.7 + 1.5	7.5 + 1.5	7.5 + 1.4
LDL in control (<100), %	19.0	21.2	20.9	25.4	23.9	29.4
N Patients w/ LDL value	579	942	595	1,024	645	1,139
Mean LDL value, + SD	113 + 35	111 + 31	111 + 32	109 + 31	111 + 33	109 + 31

Notes:
N = number;
% = percentage
m = mean; SD = standard deviation
* = significant statistical differences $p < .05$

Notably, there were no significant differences between Medicare and Non-Medicare patients at Baseline, Year 1 or Year 2 in the *percentage* of HbA_{1c} control. However, there were significant differences (p<. 05) between the two groups at baseline, Year 1 and Year 2 in LDL control. At all three evaluation periods the urban patient population had higher percentages in LDL control than rural patients. Thus, there is no support for the first hypothesis, but there was partial support for the second.

Adjusted Study Outcomes

At the end of Year 1 and Year 2 there was no significant difference in the proportion of rural and urban patients who were in HbA_{1c} control (**Table 3**). However, there were significant differences between rural and urban groups for the Total 2 Years. Rural patients were 13% less likely to be in glycemic control (OR = 0.87, p=.031) than their urban counterparts. At the end of Year 1, Year 2, and Total 2 Years there were significant differences in the proportion of rural and urban patients who were in LDL control. In Year 1, rural patients were 24% less likely to be in LDL control (OR = 0.76, *p*<. 001); in Year 2, 20% less likely to be in LDL control (OR = 0.80, *p*=.001); and from baseline to Year 2, 23% less likely to be in LDL control (OR = 0.77, *p*<.001).

Table 3: Adjusted Study Outcomes-Carle Clinic

Outcome	OR	95% CI	*P* Value
HbA_{1c} in control (<7.0)			
Year 1 Rural Patients	0.98	.85 to 1.12	.758
Year 2 Rural Patients	0.89	.78 to .101	.073
Total 2 Year Rural Patients	0.87	.76 to .99	**.031**
LDL in control (<100)			
Year 1 Rural Patients	0.76	.66 to .87	**<.001**
Year 2 Rural Patients	0.80	.70 to .92	**.001**
Total 2 Year Rural Patients	0.77	.68 to .88	**<.001**
Outcome	PE	SE	*P* Value
HbA_{1c} mean value			
Year 1 Rural Patients	.02	.04	0.663
Year 2 Rural Patients	.07	.05	0.099
Total 2 Year Rural Patients	.07	0.05	0.097
LDL mean value			
Year 1 Rural Patients	3.0	1.2	**.010**
Year 2 Rural Patients	2.9	1.1	**.008**
Total 2 Year Rural Patients	2.6	1.1	**.016**

Notes:
OR = odds ratio; CI = confidence
interval
PE = parameter estimate; SE = standard error
time in registry (years), and previous value of outcome variable

There were no significant differences between rural and urban groups at Year 1, Year 2 or baseline to Year 2 in mean HbA_{1c} values. There were significant differences between the two groups at Year 1, Year 2 and baseline to Year 2 in mean LDL values. Rural patients had LDL mean values that were approximately 3 points higher at each evaluation period than urban patients. After adjusting for baseline characteristics, rural patients had a statistically lower likelihood of glycemic and lipid control at the end of 12 and 24 months compared to their urban cohorts. Thus, the analyses offer at least partial support for the second hypothesis.

There are multiple factors that may have contributed to these differences. One key factor was the timing of the program rollout. The formal provider training sessions that accompanied the Diabetes Disease Management Program at Carle were delivered over a 1 ½ to 2-year time frame. Initial training was conducted in the larger urban clinics (Urbana and Bloomington) and emphasis was placed on regular ordering of labs according to clinical guidelines and attaining glycemic control. The same training was conducted in Carle's rural clinics approximately one year later.

Individual physician reports, indicating glycemic control levels for each physician's panel of diabetes patients, were developed over the first year of the program. These became routine, quarterly reports, distributed to all physicians, by the second year of the program. Initially, training and one-on-one support was given to RNs in the urban physician offices and focused on guiding the RNs to use the reports to support and improve patient care. This training and support again was delivered in stages, as was the formal training, with initial efforts directed first at the larger urban clinics and training of rural staff later in the process. The challenges for rural clinics in using the reports were increased because patients had a higher likelihood of using non-Carle labs for testing and systems had to be developed to facilitate collecting this data.

As Carle's diabetes disease management efforts have evolved, lipid control has received greater emphasis. This focus on attaining LDL control, in addition to glycemic control, has been strong during the past 2 years. This time period is included, in part, in Year 2 study data.

Limitations

Carle's DM researchers reported three study limitations:

1. Carle's Diabetes Registry contains limited patient information. Because of the limited patient information, it was not possible to ascertain type of diabetes (insulin dependent), medications used to manage the condition, other co-morbidities, or length of time since initial diagnosis. The Diabetes Registry limited its patient demographic information to age and gender.
2. Finally, the designation of urban and rural was based on the location of the patient's PCP practice location and not on the actual address of the patient. However, this rural/urban designation is used by the Illinois Department of Public Health in analyses of state health-related data. The designation of rural or urban counties used are unique to the Illinois DPH for the purpose of collecting and reporting statewide or county information and are not used/endorsed by ORHP. Using the patient's actual address might have influenced the patient numbers, but probably not significantly.
3. Comparisons are not appropriate to rural/urban data from Scott and White, and Florida Medicaid organizations found in later parts of the report.

V.2. Scott and White Clinic of Central Texas

Scott and White ("S&W") Clinic of Central Texas instituted DM as a pilot project for Diabetes Mellitus in 2001 at seven of the health plan's primary care clinics. After accounting for missing data there were 2,442 patients available for analysis, which included 555 rural patients, and 1,887 urban patients.

Rural-Urban Classification: Rural-Urban Commuting Areas codes (RUCAs) were used to classify facilities, according to their zip code, into one of two categories of communities -- urban/large town or small town/isolated. "Urban" areas refer to Zip Codes in an urban core area with a population greater than or equal to 50,000 or zip codes in which a significant proportion of the population commute into such an urban center. Those areas defined as "Large Town" refer to zip codes in an urban place with a population between 10,000 and 49,999, and those surrounding zip codes where a substantial proportion of the population commutes into the large town. Those areas defined as "Small Town" refer to zip codes in a place with a population between 2,500 and 9,999 persons or an area in which a relatively large proportion of the population commute into the small town. "Isolated" areas are the remaining rural areas that lack substantial commuting to urban centers, large towns, or small towns. This description above provides a general description of the logic of the classification system. However, classification was a more complex process than described here (Morrill, Cromartie & Hart, 1999; see http://www.fammed.washington.edu/wwamirhrc for full details concerning the classification system). SAS, SPSS and Stata8 were utilized for quantitative analyses.

Analysis:

We replicated the analysis used by Carle Clinic, focusing on two primary study outcomes, **glycemic control** (HbA_{1c}) and **lipid control** (LDL cholesterol). Like Carle, glycemic control was defined as those patients who had an HbA_{1c} value that was < 7.0. A value of 7.0 or greater was considered *not* in control. Patients who had missing HbA1c values were not included in the Scott & White analysis because it was not possible to determine whether a missing value was due to patient noncompliance or individual variations in the participating clinics data recording practices.

Lipid control was defined as those patients who had an LDL value that was <100. A value of 100 or greater was considered not in control—again, patients with missing LDL values were excluded for the same reasons we excluded missing HbA1c values. Secondary outcomes included mean differences in HbA_{1c} and LDL values.

After exclusion of patients who had missing HbA1c or LDL values, the pilot population was 2,442 of which 555 were rural and 1,887 were urban. We identified 80 rural Medicare patients, (14.4 percent) and 278 urban Medicare patients for comparison purposes.

Results:

The baseline characteristics of Scott & White's pilot study population are listed in **Table 4**. Seventy-seven percent (77%) of Scott & White Clinic's patients enrolled in the Diabetes DM pilot project live in areas classified as urban and 23 percent live in areas designated as rural. The mean age for S&W's rural patients was 60.2 (±14.5) and the mean patient age for urban patients was 62.1 (±14.9). Fifty three percent (53.3%) of rural patients were female; while 50.7 percent of urban patients were female.

Table 4: Scott & White DM Pilot Study, 2001 - 2003

Characteristics	Total	Rural	Urban
Number of Patients	2442	555	1887
Percent of Total	100	22.7	77.3
Age, $\bar{x}$ ± SD	61.6 ± 14.8	60.2 ± 14.5	62.1 ± 14.9
Female, %	51.3	53.3	50.7
Clinic Locations, (percent)			
Clinic BC	29.7	54.3	22.8
Clinic B	13.2	0.9	17.1
Clinic K	29.3	30.3	29.5
Clinic N	4.7	1.6	5.6
Clinic S	12.7	5.0	15.2
Clinic T	9.2	8.0	9.7
Insurance			
Medicaid	0.5	0.36	0.53
Medicare	11.4	14	10.5
Private	87	84	88.3
Self Pay	.7	1.2	.58
Months in DM Program, $\bar{x}$ ± SD	25.4 ± 1.5	25.5 ± 1.4	25.4 ± 1.5

The average duration of enrollment in S&W's DM program was nearly the same (25.4 months compared to 25.5 months) and expected since this was a pilot program and launched at all sites simultaneously. Two clinic sites (Clinic BC and Clinic K) accounted for over 50 percent of patients participating in the study. The percent of Medicare participants from rural areas was 15.4 percent, while the percent of Medicare patients from urban areas was 12.4 percent.

We analyzed differences in the percent of patients “in control,” i.e., those with less than 7.0 percent Hemoglobin A1c (“HbA1c”) and less than a 100 LDL level. These differences were analyzed across rural and urban patient groups (**Table 5**).

Table 5: Scott & White Clinic Unadjusted Outcomes for HbA1c and LDL: Comparison of Rural and Urban patients

Table 5
Scott & White Clinic Unadjusted Outcomes by Rural/Urban

	Rural	Urban	P-value
HbA_{1c} in control (<7.0), %	78%	81%	.10
LDL in control (<100), %	26.1%	33%	.002
N Patients	555	1887	
Mean HbA_{1c} ± SD	4.85 ± 2.2	4.59 ± 2.0	.023
Mean LDL ± SD	99.85 ± 64.7	98.76 ± 38.7	.698

Analysis revealed that urban and rural DM participants differed in HbA1c and LDL levels. Urban DM participants were significantly more likely to have HbA1c in control (76 percent compared to 62 percent) than rural patients ($p < .01$). Urban DM participants were also more likely to have LDL in control (< 100) than rural DM participants, (33 percent compared to 26 percent). This difference was statistically significant at $p < .01$.

The mean HbA1c level for rural patients was 4.85 (± 2.2) and 4.59 (± 2.0), this difference being significant at p<. 01). Mean LDL levels were within optimal guideline ranges, but were not statistically significant, **(Table 5).**

Table 6 provides the odds ratios predicting the likelihood that HbA1c will be within the range of control (outcome variable = HbA1c < 7.0).

Table 6: Adjusted Study Outcomes for HbA1c –Scott and White Clinic

Table 6
HbA_{1c} in Control

	OR		95% CI	P-value
Rural	0.	.718	1.19	.57
Age		2.07	3.69	.0
Female		.764	1.153	.57
Clinic01		.290	1.04	.06
Clinic02		.440	1.73	.70
Clinic04		.364	1.31	.26
Clinic05		.361	1.70	.54
Clinic06		.298	1.13	.11
Clinic-T (Referent)				
Medicaid	1.	.284	4.018	.92
Medicare		.742	1.564	.69
Self Pay	0.	.111	.755	.01
Private (Referent)				
Time in DM Program (yrs)	1.	.986	1.120	.12

(Clinic 3 was not included in the analysis because of low numbers of rural patients)

There were no statistically significant differences between rural DM participants and urban DM participants in the likelihood that HbA1c would be more likely to be in control based on urban-rural classification. Differences among clinics are also noted with the “referent” clinic being less likely than other clinics to have DM participants considered to be in control. Medicare patients are less likely than private pay DM participants to be “in control;” however, this difference is not statistically significant. The odds ratios having LDL levels considered “in control” revealed that participants who were insured through Medicare (age 65 and older) are more likely than those younger to be in control, however, these differences were not at a significance level of P<.05 or greater.

Table 7: Adjusted Study Outcomes—LDL levels. Scott and White Clinic

Table 7
LDL in Control

	OR		95% CI	P-value
Rural		.950	1.478	.132
Age		1.004	1.017	.002
Female		1.014	1.418	.034
Clinic01		.291	.687	.000
Clinic02	1.	1.090	2.619	.019
Clinic04		.290	.674	.000
Clinic05	1.	.777	2.229	.306
Clinic06	1.	.803	1.93	.325
Clinic07 (Referent)				
Medicaid		.042	2.79	.317
Medicare	1.	.923	1.579	.168
Self Pay		.020	1.24	.080
Private (Referent)				
Time in DM Program	1.	1.012	1.154	.080

Differences in LDL control among clinic locations are noted. Younger patients and females are more likely than older participants and males to be in "control". Self-pay participants were significantly less likely than employer sponsored or privately insured to have LDL levels in control **(Table 7).**

The analysis of Scott & White data thus offered some support for the second hypothesis. In contrast, it provided only limited support for the first hypothesis.

Limitations of the Study:

1. **Data Limitations:** The analyses of Scott & White's diabetes DM data were constrained by the number of missing HbA1c values. The missing data was attributed to different practices and available time of personnel to enter data at the various pilot sites. Unlike Carle Clinic, it was not possible to determine that patients with missing observations were "noncompliant" and thus "not in control" and as a result these observations were excluded from the analysis. It is not clear what we would learn from those patients who were not included in the analysis.
2. Rural-urban designation was based on the patients' zip code rather than the location of the clinic. Additionally, the designation of rural or urban counties used are unique to the Illinois DPH for the purpose of collecting and reporting statewide or county information and are not used/endorsed by ORHP. For these reasons rural-urban comparisons of S&W's outcomes with Carle's outcomes is not possible. Moreover, comparisons between plans were not intended inasmuch as the patient populations in each system's region are very different.

V.3. Florida Diabetes Disease Managed Care Data Analyses

The State of Florida Department of Health Services provided *The Chronic Disease Management in Rural Areas Project* with diabetes DM claims data for patients enrolled in Medicaid managed care for years 1999, 2000 and 2001. Florida's DM data included over 12 million diabetes patients enrolled in Florida's Diabetes Managed Care programs. [3]

V.3.1 Results

Table 8 provides basic rural/urban comparisons of diabetes DM service utilization within Florida's Medicaid managed care population. Rural patients enrolled in Florida's Medicaid Diabetes DM programs were less likely to have any provider claim or medical claim, ($p < .000$), but were more likely to be in a nursing home ($p < .005$). Higher percentages of rural patients relied on public or private transportation assistance than did urban patients ($p < .000$). Rural patients were more likely than urban patients to have a pharmacy claim, (55.2 percent compared to 53.9 percent) ($p<.001$), and were more likely to have Medicare Part B coverage ($p < .000$).

[3] The size of the Florida data sets required the purchase of a separate server to store the data and several hundred person hours to "clean" it for analysis using SAS. This phase of the project lasted over 8 months, but after cleaning and recoding Florida's data we discovered that two important variables, gender and race, had not been included in the data shipped. This is discussed as a limitation of the study.

Table 8: DM Service Utilization in Florida's Medicaid Managed Care DM Programs by Rural Versus Urban Designation[†]

Variable	Urban	Rural	*P* value[‡]
Home/Community Services	6.8	7.1	.221
Capitation	2.9	3.0	.620
Case management	1.0	0.9	.131
Pharmacy	53.9	55.2	.001
Public transportation	2.7	3.6	.000
Home health	2.7	0.9	.000
Mental/drug counseling	2.3	1.7	.000
Medicare Part B	4.7	5.8	.000
Institutional care	1.8	2.1	.005
Outpatient care	1.2	1.5	.027
Provider claim	16.2	13.2	.000
Private transportation	1.0	1.6	.000
Medicare recipient	0.2	0.3	.429
Vision claim	1.3	1.5	.024
Institutional claim	5.0	6.7	.000
Medical claim	41.1	38.1	.000
Pharmacy claim	53.9	55.2	.001

[†]Rural designation is based on RUCA codes; analyses are for respondents age 14 and over.
[‡]*P* values from χ^2 test.

Table 9 provides rural-urban differences in diabetes DM service utilization by year, 1998-99, 1999-00, and 2000-01.

Table 9: Urban-Rural Differences In Claims Among Enrollees in Florida's Medicaid Managed Care Disease Management Programs, 1998 – 2001						
Year	**1998 - 1999**		**1999-2000**		**2000-2001**	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Capitated Plan	3%	3%	3.6%	3.1%	2.8%	2.7%
Case Management	0.9%	1.2%	1%	1%	1%	1%
Home & Comm. Medicine	9%	7%	6.2%	6.8%	6.7%	6.3%
Pharmacy Services	54%	53%	57%	55%	54.2%	53.5%
Public transportation	4%	3%	3.4%	2.7%	3.5%	2.4%
Private Transportation	2%	1%	1.6%	1%	1.2%	1%
Home Health Services	1%	2%	1%	3%	1.2%	3.2%
Drug/ETOH Services	1.8%	2.6%	1.6%	2.2%	1.2%	2%
Medicare Part B	7%	6%	5.4%	4.1%	5%	3.6%
Outpatient Services	1%	1.30%	1.5%	1.2%	1.6%	1.4%
Provider Services	12.5%	16%	12.3%	15.4%	15%	18%
Vision Claim	1.6%	1.3%	1.3%	1.3%	1.5%	1.4%
Presently in Nursing Home	14%	12%	13%	11.6%	15%	14%
Institutional Claim	6%	5%	6.5%	55%	7.5%	5.4%
Medical Claim	40%	43%	37%	40%	38%	41%
Pharmacy Claim	54%	53%	57%	55%	54%	53%

We also analyzed the Florida data using a multivariate model. **Table 10** provides odds ratios for three years of claims data. The dependent variable in the model is "rural". Looking at utilization of services or drugs, across all three years, rural DM participants were less likely to have received case management, home health or mental/drug treatment services ($p < .000$). However, they were more likely to receive nursing home services, ($p < .000$). Thus, there is some support for the general theme of the second hypothesis suggesting less DM related services for rural patients.

Table 10: Multivariate analysis of Relative Likelihood of Rural Diabetics' Enrollment and Claims Activity by Age and Type of Claim

Dependant Variable: Rural	1998 - 1999		1999-2000		2000-2001	
	OR	P>|z|	OR	P>|z|	OR	P>|z|
age 14_20	0.68	**	0.96		1.06	
age 31_40	1.12		0.97		0.93	
age 41_50	1.13		0.92		0.97	
age 51_60	1.32	***	1.18		1.19	**
age 61_64	1.18		0.92		1.04	
age 65_75	0.91		0.86		0.87	
age 76 or greater	0.83	**	0.85		0.82	**
Capitated Claim	0.78		0.66	***	0.64	***
Case Management	0.65	**	0.63	***	0.60	***
Home and Comm. Health	1.21		0.58	***	0.76	**
Home Health	0.44	***	0.19	***	0.25	***
Pharmacy Claim	0.88		0.62	***	0.68	***
Public Transportation	1.04		0.72	***	0.94	
Mental or Drug Treatment	0.58	***	0.42	***	0.64	***
Medicare Part B	0.96		0.81		1.00	
Institutional Care	0.69	**	0.64	***	0.87	
Outpatient Care	0.66	**	0.69	**	0.70	**
Provider Claim	0.62	***	0.45	***	0.50	***
Private Transportation	1.20		0.94		0.83	
Medicare Recipient	1.23		0.86		0.69	
Vision Claim	1.07		0.62	***	0.72	**
In a Nursing Home	1.35	***	1.13	***	1.06	

**** = P < .05**
***** = P < .00**
(Source Authors' computations using Florida Medicaid Managed Care Data for years 1998 - 2001)

Limitations of the Florida claims data: There were numerous limitations associated with using the Florida claims data:

1. The size of the Florida data allowed for statistical significance despite relatively small differences in percentages between urban and rural DM service utilization.
2. The data vendor's inadvertent omission of gender and race variables, resulted in an inability to evaluate disparities and differences in the receipt of DM services associated race and ethnicity.
3. Data codebooks or dictionaries provided inadequate documentation for some variables.

VI. Summary of Findings and Policy Implications

This study provides support for current efforts expanding chronic disease management into Medicare and Medicaid fee-for-service populations—even within rural and underserved populations. The two Medicare programs successes, evident within older, diverse and difficult patient populations, demonstrate that DM can be used as an effective approach to chronic disease management and care coordination.

In sum, the examination of data in these populations which included Medicare and Medicaid patients showed the following:

1. Medicare and Non-Medicare patients enrolled in the two clinics' diabetes DM programs demonstrated improvement in mean HbA1c levels and LDL levels from baseline to Year-2.
2. There were no significant rural-urban differences in the percent of patients considered to be in "control" for hemoglobinA1c ("HbA1c") at either clinic. Differences between the two clinics in the percent of patients considered to have HbA1c in control were not compared due to internal variations in the treatment of missing data, and the designation of rural or urban counties used by Carle Clinic are unique to the Illinois DPH for the purpose of collecting and reporting statewide or county information. One clinic opted to treat "missing" observations as "out of control" while the second clinic considered missing data as an unreliable indicator of participation in the program and therefore these observations were excluded altogether from that clinic's analyses.

3. There were no statistically significant differences in the percent of Medicare patients considered to be in "control" for HbA1c compared to non-Medicare patients participating in the program at either clinic.
4. There were significant rural-urban differences in the percent of patients considered to be in "control" for low-density lipids ("LDL") in both systems.
5. There were no statistically significant differences in the percent of Medicare patients considered to be in "control" for LDL compared to the percent of non-Medicare patients participating in the program. Analysis of Florida's Medicaid Diabetes DM data showed that rural patients enrolled in Medicaid DM were less likely than urban patients to have claims for provider services, home health or medical clinic services. However, the analysis showed that rural Medicaid patients enrolled in Florida's diabetes DM program were more likely than patients in urban areas to receive pharmacy service, home and community services and to have a claim for public and private transportation.

The explanation for the similarities and differences in the analyses of Medicare patients is not clear-cut. First, Carle Clinic and Scott & White Clinic offer evidence of diabetes DM's contribution to increased "control" of hemoglobinA2c (HbA1c) and LDL (low density lipids[4]) over a two-year time period. The fact that DM-associated "control" of HbA1c does not vary according to rurality or Medicare status of a population suggests that this element of control can be attained with some success regardless of geographic setting or age (with Medicare being an older population). However, the finding that LDL is less "controlled" in rural populations than in urban populations may reflect greater patient access problems in

[4] LDL (Low Density Lipids) measure total Cholesterol – HDL (high density lipids). LDL reflects "bad" lipids or fats in the bloodstream. High levels (> 100) are considered one of the risk factors of cardiovascular disease.

monitoring and controlling this indicator in rural settings. It is possible, too, that it may reflect less healthy diet or exercise habits among rural residents. In sum, rural residents may have less access to primary care offices or medical labs for more frequent monitoring of LDL and less access to nutritional counseling and support afforded in more urban settings.

Finally, the Florida Medicaid data reinforces the notion that rural patients may suffer from provider access challenges more so than urban patients. Rural patients enrolled in Medicaid DM were less likely than urban patients to have claims for provider services, home health, or medical clinic services; suggesting less rural access to these providers. Florida's rural Medicaid patients enrolled in Florida's diabetes DM program, in contrast, were more likely than patients in urban areas to receive pharmacy service, home and community services, and to have a claim for public and private transportation. This pattern would suggest that limited access to clinic and other provider services in rural areas may contribute to greater difficulty in gaining control over diabetes management.

Collectively these findings suggest that disease management policies and programs targeting Medicare and Medicaid populations should take into account possible barriers and constraints found in rural populations and settings. And, more specific to the findings reported here, attention should focus on access to services that can contribute more directly to control of LDL in diabetes DM. Additional investigation might be given to increasing access to long-term nutritional and exercise support in rural settings that might help to address rural disparities in control of LDL. Similarly, continued study of access to primary care providers for Medicaid DM populations and other DM populations in rural areas is needed to see determine whether any such access differentials might account for disparities in LDL control.

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