Abstract

Introduction

The objective of our study was to estimate the long-term cost-effectiveness of a lifestyle modification program led by community health workers (CHWs) for low-income Hispanic adults with type 2 diabetes.

Methods

We forecasted disease outcomes, quality-adjusted life years (QALYs) gained, and lifetime costs associated with attaining different hemoglobin A1c (A1c) levels. Outcomes were projected 20 years into the future and discounted at a 3.0% rate. Sensitivity analyses were conducted to assess the extent to which our results were dependent on assumptions related to program effectiveness, projected years, discount rates, and costs.

Results

The incremental cost-effectiveness ratio of the intervention ranged from $10,995 to $33,319 per QALY gained when compared with usual care. The intervention was particularly cost-effective for adults with high glycemic levels (A1c > 9%). The results are robust to changes in multiple parameters.

Conclusion

The CHW program was cost-effective. This study adds to the evidence that culturally sensitive lifestyle modification programs to control diabetes can be a cost-effective way to improve health among Hispanics with diabetes, particularly among those with high A1c levels.

Introduction

Diabetes accounts for an estimated 11% of health care costs in the United States; 8.3% of the US population has diabetes (1). Adults over the age of 50 with diabetes are more likely to develop cardiovascular disease and have decreased life expectancy of 7.5 to 8.2 years compared with those without diabetes (2). Although the Hispanic paradox – that Hispanics have greater life expectancy than their non-Hispanic counterparts – is well-documented (3), Hispanics are disproportionately affected by diabetes (4,5). The prevalence of diabetes in US adult Hispanics is 13.3% compared with 7.1% for non-Hispanic whites (6). Hispanics with diabetes have hemoglobin A1c (A1c) levels that are 0.5 percentage points higher than non-Hispanic whites (7). In one study, Hispanic males had mean A1c levels 9.3% higher than non-Hispanic white males (8.2% vs 7.5%), and Hispanic females had mean A1c levels that were 3.9% higher than non-Hispanic white females (7.9% vs. 7.6%) (8). Hispanics are 1.5 times more likely to die from diabetes than their non-Hispanic white counterparts (9). Reasons cited for these disparities include less access to diabetes-specific care, language barriers, beliefs about diabetes, and health insurance coverage status (7).

A 1% reduction in A1c levels has been correlated with a 21% reduction in vascular complications in people with diabetes, resulting in fewer complications and reduced lifetime health care costs (10). Additionally, researchers have found that among the 2.1 million people in the United States with type 2 diabetes, those with good glycemic control...
Community health workers (CHWs) are effective in motivating sustained lifestyle changes in Hispanics with diabetes. CHW interventions improve knowledge about this chronic health condition (12,13), self-management (13–15), and self-efficacy (13). CHW interventions have also resulted in significant reductions in A1c levels (12,13,15,16). Although research has analyzed the cost-effectiveness of CHW-based diabetes management interventions delivered in primary care settings (17,18), we know of no cost-effectiveness studies of diabetes self-care interventions that involve CHWs delivering home-based counseling and education. Given this population’s lack of access to traditional health care services, the provision of home-based diabetes self-management education is likely to add substantial value to, and improve the effectiveness of, diabetes management initiatives. However, program delivery in patient homes necessitates added costs. This study analyzes the cost-effectiveness of a diabetes management intervention for Hispanics delivered in both primary care and home settings. The objective of our study was to estimate the long-term cost-effectiveness of a lifestyle modification program led by community CHWs for low-income Hispanic adults with type 2 diabetes.

Methods

Priority population

The priority population for this study was Hispanic adults aged 18 years or older with type 2 diabetes who were patients at the Mercy Clinic in Laredo, Texas, from October 2009 to January 2010. Laredo is in south Texas on the Mexico border, in Webb County. About 96% of the population of Webb County is of Hispanic origin, and median household income is $37,140 (19). Almost half of adults aged 18 to 64 in the Laredo metropolitan statistical area (MSA) lack health insurance coverage (20).

Analysis inclusion prerequisites were a diagnosis of type 2 diabetes, availability of baseline and follow-up A1c readings, and evidence of program participation. Forty-six participants met these criteria. Of the 46, 16 had baseline A1c levels at or below 7%, indicating good glycemic control, and were therefore excluded from the study group. The sample analyzed consists of the remaining 30 participants.

Intervention components

The University of Texas Community Outreach (UTCO) intervention is an ongoing community-based diabetes education and self-management program that uses community partnerships and trained CHWs to reach participants. Four Texas counties, including Webb County, host UTCO programs. We used first-wave evaluation data (follow-up data collected through January 15, 2011) from the Webb County UTCO program for this analysis.

Mercy Clinic, the primary Webb County partner in the UTCO program, provides primary health care, health education, and social services to the financially disadvantaged and medically underserved population. Intervention components include home-based CHW visits, classroom health education classes, nutrition classes, exercise classes, and counseling sessions. The nutrition classes teach new diabetes management skills. Exercise classes provide venues and social support for physical activity. Counseling sessions provide targeted guidance on individual issues participants have in managing their diabetes. Home visits provide reinforcement of themes covered in classes and support in creating cues to action. CHWs bring schedules of upcoming classes to home visits, provide guidance on which sessions participants should give priority to, and assist participants in overcoming barriers related to effective diabetes management.

Five state-certified CHWs and a nurse educator are the primary UTCO service providers. Four of the 5 CHWs were previously employed by Mercy Clinic, and external funding of the UTCO program covered the project director’s salary and enabled hiring of a fifth CHW and a nurse practitioner. CHWs received training through the UT Health Science Center School of Public Health, Brownsville Regional Campus, on leading nutrition and exercise classes and on data-gathering protocols. All CHWs, who are called promotoras in the Hispanic community, are certified through the Texas Department of Health and Human Services’ CHW training program. The CHWs’ primary role is to develop relationships with participants to provide individualized guidance, one-on-one diabetes education, and counseling aimed at increasing participants’ ability and self-efficacy to manage their diabetes. Additionally, CHWs and the nurse educator teach participants in group environments how to manage their diabetes, improve their nutrition, and lose weight. Several volunteers, including a dietitian, a certified Zumba instructor, and students from Texas A&M International University (TAMIU), assist with teaching nutrition classes, leading exercise classes, and facilitating group counseling sessions.

To be included in the analysis, participants had to have received at least 1 home visit in addition to having a baseline A1c reading above 7.0. We set these criteria for several reasons: 1) many people attended classes only, and our primary focus was the combination of CHWs in clinical (classes) and community (home) settings; 2) home visits are the most expensive component of the intervention, and we wanted to include these costs in our analysis; 3) we hypothesized that these in-home activities would be key components to the program’s success and to sustained outcomes; and 4) the
agreement between Mercy Clinic and participants included attendance at both classes and home visits. All participants attended nutrition and health education classes (mean number of classes attended, 8.3); 77% attended exercise classes (mean number of classes attended, 4.2); and 33% attended counseling sessions (mean number of sessions attended, 4.3). Follow-up A1c readings were taken periodically, ranging from 37 to 565 days (mean, 75 days) for the sample.

**Costs**

We assessed the cost-effectiveness of the UTCO intervention in this location from a societal perspective. The societal perspective includes all measurable opportunity costs, representing all groups affected by a program. To assess program costs, we included staff time and valuation of volunteer and participant time for home visits, educational classes, counseling sessions, exercise classes, class-related materials, and mileage related to home visits.

Mercy Clinic paid staff salaries and for program supplies. We used the Bureau of Labor Statistics Metropolitan and Non-Metropolitan Area Occupational Employment and Wage Estimates for the Laredo MSA (21) to value volunteer and participant time. Where volunteer occupation was known (eg, dietitian), we used the mean wage for that occupation, and we included the value of fringe benefits and taxes for clinic staff and volunteers. We used the Texas minimum wage ($7.25 hourly) to value student volunteer time and the average hourly wage rate for the Laredo MSA ($16.14) to value the time of study participants. This average rate was likely higher than what study participants were earning in their jobs. We added only Federal Insurance Contributions Act (FICA) taxes to participant base wages. To calculate the average cost per home visit, we used information gathered from CHW interviews about the typical length of a home visit, the time needed to schedule visits, and travel time to and from appointments. Estimated average mileage expense was assessed at $0.51 per mile. Initial home visits took, on average, twice as long as subsequent visits but involved the same amount of scheduling and travel time; we factored this into total home visit expenses and assigned a value of $80.59 for initial home visits and $48.16 for follow-up visits.

We calculated a composite fixed cost per class from information gathered from Mercy Clinic records on time and resources needed to deliver each type of class. We weighted the cost for each type of education class by the frequency with which the class was offered and summed them to derive an average class cost. We similarly developed composite per-session fixed costs for exercise classes and counseling sessions. Total costs for each activity category were the sum of the fixed costs of the classes and aggregate attendee time costs. This composite fixed cost was multiplied by the total number of classes or sessions; to this product we added the average attendance and the per-participant time cost of attendance to derive the total costs of attendees. Ten percent of the total CHW training expense was included in the intervention costs. The time costs for staff, volunteers, and participants; the class and session time; mileage costs; resource costs; and the CHW training expenses were summed to derive a total program cost for the sample, resulting in a per-participant program cost of $1,175.63 for the 18-month period. These cost calculations ignore economies of scale that would accrue from the program being run at a capacity more reflective of real-world situations. To create a real-world cost structure, we used the original fixed and variable costs for each activity, but increased average attendance levels to reflect data collected on actual class attendance (ie, which included participants not used in the sample); we then calculated intervention costs based on the prevalence of diabetes in the Archimedes Model (Archimedes, Inc, San Francisco, California) (n = 6,551) (Table 1).

Finally, because diabetes management is a long-term process, we estimated ongoing postintervention costs assuming continued participation in educational classes, counseling, and exercise activities at 50% of intervention levels over the 3 periods of our projections (5, 10, and 20 years). This resulted in annual post-intervention costs of $140.63 per participant. We used data from the 2006 Medicare Current Beneficiary Survey for medical costs (22); lifestyle change costs were taken from a systematic review of costs of major US commercial weight loss programs (23).

**Projecting outcomes and medical costs**

We used the Archimedes model to project the intervention’s incremental lifetime health outcomes and related expenditures based on changes in A1c levels. It simulates the effects of interventions by generating multiyear forecasts of predicted disease outcomes, health behaviors, and health care costs relative to a hypothetical control group with similar demographic characteristics. Studies have independently validated the model for diabetes outcomes research (24).

We applied data from the Archimedes Cardio-Metabolic Risk (CMR) dataset, which includes data from a simulated US representative sample of 100,000 people aged 30 to 85 years (25) to our study sample of 6,551. The CMR dataset includes the results of 19 simulated controlled clinical trials comparing standard care (defined as current levels of care in the US population) with a set of health management interventions targeting cardio-metabolic risk, including glycemic control (25).

For the primary analysis, we grouped study participants into 2 cohorts: those whose diabetes was brought under control (ie, follow-up A1c reading was ≤7%) and those who were still out of control at follow-up (A1c >7%) (Table 2). During the intervention, the diabetes of 60% of the subjects was brought under control. We assumed that the sample’s levels of glycemic control would fluctuate over time. When A1c becomes uncontrolled, the intervention in the CMR
Results

The effects of the UTCO intervention are reflected in clinical outcomes for a cohort of participants whose A1c levels at the beginning of the intervention were above 7%, but fell to 7% or below during the course of the 18-month intervention (Table 3). We used the real-world cost structure and assumed ongoing annual costs at the 50% level. On the basis of our estimates using the Archimedes model, the UTCO intervention is expected to reduce the risk of a myocardial infarction by 2.6%, foot ulcers by 5.6%, and foot amputation by 3.5%. A1c levels will fall by 11.7%, and 413.52 life years will be gained through the intervention over a 20-year period. After accounting for health disutility weights, the UTCO intervention results in an incremental gain of 394.92 QALYs (Table 4).

The resultant ICER for a 20-year period was $33,319 per QALY gained for the entire population relative to standard care (Table 4). The intervention was most cost-effective for those aged 50 to 65 years, with a ratio of $30,786 per QALY gained. The intervention had an ICER of $130,272 per QALY gained over a 10-year period and $56,099 per QALY gained over a 5-year period.

We also conducted sensitivity analyses to assess how our results would differ under different assumptions. The results stand up to variation for all parameters except when lowering program effectiveness from 60% to 41%, which increased the ICER per QALY gained to $51,462. Raising the effectiveness to 73% lowered the ICER to $28,093 per QALY gained. Adjusting the discount rate to 0% and to 6% resulted in ICERs per QALY gained of $30,026 and $37,473, respectively. Finally, lowering annual costs from 50% of program costs to 25% resulted in an ICER of $21,977 per QALY gained; increasing them to 75% resulted in $45,696 per QALY gained.

Eighty percent of the cohort that entered the program with an A1c level above 9% lowered their A1c levels to below 9% at follow-up. For this cohort, the ICER was $10,995 per QALY gained. This is largely a function of the long-term health care cost savings accrued. Decreasing effectiveness to 60% raised the ICER to $18,680 per QALY gained; increasing effectiveness to 100% lowered it to $6,384 per QALY gained. Setting the discount rate for costs as well as QALYs at 0% lowered the ICER to $9,980 per QALY gained, and setting it at 6% raised the ICER to $12,405 per QALY gained. Finally, lowering continuation costs to 25% lowered the ICER to $2,156 per QALY gained; raising these costs to 75% resulted in an ICER of $19,834 per QALY gained.

Discussion

The 20-year cost-effectiveness of the UTCO CHW-based diabetes management program was $33,319 per QALY gained for the cohort of low-income Hispanics in our primary analysis. The ratios were $56,099 and $130,272 for the 10- and 5-year projections, respectively. Because diabetes is a disease whose full effects occur over the long term, the higher ICERs based on shorter term projections are not surprising.

From a health care standpoint, interventions to prevent or treat diabetes are deemed cost effective if they fall under the threshold of $50,000 per QALY gained (30). Thus, the UTCO intervention’s cost per additional QALY over 20 years compares favorably to other interventions, despite its societal perspective.

Our estimates also compare favorably to cost-effectiveness studies of other lifestyle modification interventions for people with diabetes. Eddy and colleagues modeled the cost-effectiveness of the Diabetes Prevention Program (DPP) lifestyle intervention and found an ICER of $24,500 per QALY gained when compared with standard care over a 30-year period (31). Herman and colleagues used a Markov model to estimate the cost effectiveness of the DPP lifestyle modification intervention and reported an ICER of $8,800 per QALY gained (32). A Netherlands-based study of a 3-
year, 1-time intensive lifestyle intervention targeting obese adults with impaired glucose tolerance found the intervention to be cost effective in reducing new cases of diabetes over a 20-year period (33). Gilmer and colleagues studied the impact of diabetes case management in a similar population and found the intervention to be cost effective for the uninsured and publicly insured populations (17).

Finally, our results for the cohort with baseline A1c above 7% likely underestimate the health gains accruing from the intervention for 2 reasons. First, the average A1c level at baseline was higher (9.55%) for our predominantly Hispanic sample than that of the US representative population in the Archimedes CMR forecast dataset (8.64%). Second, our analysis of the cohort with baseline A1c levels above 9% demonstrates greater cost effectiveness than the above-7% cohort, despite projecting reductions in A1c to only 6% or lower, 2 percentage points above the standard for diabetes control. It appears that it is more cost effective to focus resources on reducing the glycemic levels of people whose A1c levels are out of control to 9% as compared with allocating resources to reduce A1c levels to 7% for the population with A1c levels between 7% and 9%.

The cost effectiveness of the UTCO intervention appears to be higher, or at least comparable, to other lifestyle and health-management interventions targeting Hispanics. CHWs are instrumental in gaining compliance with the program through relationships, likely because of the rapport they develop with clients. What seems to make CHWs so effective is that they provide services in the communities in which they live while also being peers of program participants. In the case of diabetes interventions, many CHWs have diabetes themselves, resulting in greater rapport and trust being established with program participants. They also provide more personalized interaction than traditional health care professionals, resulting in improved access to health care and better self-efficacy (33). Our study suggests that CHWs are not only effective at improving health and health care quality outcomes, but seem to be able to do so, from a societal perspective, in a cost-effective way.

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References

1. American Diabetes Association. Economic costs of diabetes in the US in 2007. Diabetes Care 2008;31(3):596–615. PubMed

2. Franco OH, Steyerberg EW, Hu FB, Mackenbach J, Nusselder W. Associations of diabetes mellitus with total life expectancy and life expectancy with and without cardiovascular disease. Arch Intern Med 2007;167(11):1145-51. CrossRef PubMed

3. Markides KS, Coreil J. The health of Hispanics in the Southwestern United States: an epidemiologic paradox. Public Health Rep 1986;101(3):253-65. PubMed

4. McWilliams JM, Meara E, Zaslavasky AM, Ayanian JZ. Differences in control of cardiovascular disease and diabetes by race, ethnicity, and education: US trends from 1999 to 2006 and effects of Medicare coverage. Ann Intern Med 2009;150(8):505-15. PubMed

5. Saydah S, Cowie C, Eberhardt MS, de Rekenere N, Narayan KMV. Race and ethnic differences in glycemic control among adults with diagnosed diabetes in the United States. Ethn Dis 2007;17(3):529-35. PubMed

6. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta (GA): US Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.
7. Kirk JK, Passmore LV, Bell RA, Narayan KM, D'Agostino RB Jr, Arcury TA, Quandt SA. Disparities in A1C levels between Hispanic and non-Hispanic white adults with diabetes: a meta-analysis. Diabetes Care 2008;31(2):240-6. CrossRef PubMed

8. Harris MI, Eastman RC, Cowie CC, Flegal KM, Eberhardt MS. Racial and ethnic differences in glycemic control of adults with type 2 diabetes. Diabetes Care 1999;22(3):403-8. CrossRef PubMed

9. National Center for Health Statistics. LCWK11. Deaths, percent of total deaths and rank order for 113 selected causes of death and Enterocolitis due to Clostridium difficile, by Hispanic origin, race for non-Hispanic origin and sex: United States, 2008. Atlanta (GA): Centers for Disease Control and Prevention; 2012. http://www.cdc.gov/nchs/data/dvs/LCWK11_2008.pdf. Accessed April 2, 2012.

10. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. BMJ 2000;321(7258):405-12. CrossRef PubMed

11. Oglesby AK, Seknik K, Barron J, Al-Zakwani I, Lage MJ. The association between diabetes related medical costs and glycemic control: a retrospective analysis. Cost Eff Resour Alloc 2006;4:1. CrossRef PubMed

12. Lujan J, Ostewald SK, Ortiz M. Promotora diabetes intervention for Mexican Americans. Diabetes Educ 2007;33(4):660-70. CrossRef PubMed

13. Ryabov I, Richardson C. The role of community health workers in combating type 2 diabetes in the Rio Grande Valley. J Prim Care Community Health 2011;2(1):21-5. CrossRef

14. Babamoto KS, Sey KA, Camilleri AJ, Karlan VJ, Catalasan J, Morisky DE. Improving diabetes care and health measures among Hispanics using community health workers: results from a randomized controlled trial. Health Educ Behav 2009;36(1):113-26. CrossRef PubMed

15. Culica D, Walton JW, Harker K, Prezio EA. Effectiveness of a community health worker as sole diabetes educator: comparison of CoDE with similar culturally appropriate interventions. J Health Care Poor Underserved 2008;19(4):1076-95. CrossRef PubMed

16. Ingram M, Tores E, Redondo F, Bradford G, Wang C, O'Toole ML. The impact of promotoras on social support and glycemic control among members of a farmworker community on the US-Mexico border. Diabetes Educ 2007;33(Suppl 6):172S-8S. CrossRef PubMed

17. Gilmer TP, Roze S, Valentine WJ, Emy-Albrecht K, Ray JA, Cobden D, et al. Cost-effectiveness of diabetes case management for low-income populations. Health Serv Res 2007;42(5):1943-59. CrossRef PubMed

18. Brownson CA, Hoerger TJ, Fisher EB, Kilpatrick KE. Cost-effectiveness of diabetes self-management programs in community primary care settings. Diabetes Educ 2009;35(5):761-9. CrossRef PubMed

19. US Census Bureau. State and county QuickFacts. http://quickfacts.census.gov/qfd/states/48/48479.html. Accessed October 28, 2011.

20. Centers for Disease Control and Prevention. SMART: BRFSS city and county data. http://apps.nccd.cdc.gov/BRFSS-SMART/MMSARiskChart.asp?yr=2007&MMSA=207&cat=HC&qkey=880&grp=0. Accessed October 28, 2011.

21. US Bureau of Labor Statistics. May 2011 Metropolitan and nonmetropolitan area occupational employment and wage estimates, Laredo, Texas. http://www.bls.gov/oes/current/oes_29700.htm. Accessed July 7, 2011.

22. Medicare current beneficiary survey, calendar year 2006. Baltimore (MD): US Department of Health and Human Services, Health Care Financing Administration; 2006.

23. Tsai AG, Wadden TA. Systematic review: an evaluation of major commercial weight loss programs in the United States. Ann Intern Med 2005;142(1):56-66. PubMed

24. Stern M, Williams K, Eddy D, Kahn R. Validation of prediction of diabetes by the Archimedes model and comparison with other predicting models. Diabetes Care 2008;31(8):1670-1. CrossRef PubMed

25. Archimedes Inc. Archimedes outcomes analyzer: Cardio-Metabolic Risk dataset. http://archimedesmodel.com/outcomes-analyzer.html. Accessed October 28, 2011.

26. Sullivan PW, Ghushchyan V. Preference-based EQ-5D index scores for chronic conditions in the United States. Med Decis Making 2006;26(4):410-20. CrossRef PubMed

27. Documentation Files PUF. Agency for Healthcare Research and Quality. http://www.meps.ahrq.gov/PUFFiles/H52/H52doc.htm. Accessed July 30, 2012.

28. The EuroQol Group. http://www.euroqol.org/download/ref.pdf. Accessed July 30, 2012.

29. Coffey JT, Brandle M, Zhou H, Marriott D, Burke R, Tabaei BP, et al. Valuing health-related quality of life in diabetes. Diabetes Care 2002;25(12):2238-43. CrossRef PubMed
30. Li R, Zhang P, Barker LE, Chowdhury FM, Zhang X. Cost-effectiveness of interventions to prevent and control diabetes mellitus: a systematic review. Diabetes Care 2010;33(8):1872-94. CrossRef PubMed

31. Eddy DM, Schlessinger L, Kahn R. Clinical outcomes and cost-effectiveness of strategies for managing people at high risk for diabetes. Ann Intern Med 2005;143(4):251-64. PubMed

32. Herman WH, Hoerger TJ, Brandle M, Hicks K, Sorensen S, Zhang P, et al. The cost-effectiveness of lifestyle modification or metformin in preventing type 2 diabetes in adults with impaired glucose tolerance. Ann Intern Med 2005;142(5):323-32. PubMed

33. Jacobs-van der Bruggen MAM, Bos G, Bemelmans WJ, Hoogenveen RT, Vijgen SM, Baan CA. Lifestyle interventions are cost-effective in people with different levels of diabetes risk: results from a modeling study. Diabetes Care 2007;30(1):128-34. CrossRef PubMed

34. Reinschmidt KM, Hunter JB, Fernández ML, Lacy-Martínez CR, Guernesey de Zapien J, Meister J. Understanding the success of promotoras in increasing chronic diseases screening. J Health Care Poor Underserved 2006;17(2):256-64. CrossRef PubMed

Tables

Table 1. Trial Versus Real World Scenarios, Cost-Effectiveness Analysis of a Community Health Worker Intervention for Hispanic Adults with Diabetes, October 2009–January 2010

| Category                | Trial Scenario, n = 30<sup>a</sup> | Real-World Scenario, n = 6,551<sup>b</sup> | Real-World Scenario, Ongoing, n = 6,551<sup>c</sup> |
|-------------------------|-----------------------------------|-------------------------------------------|--------------------------------------------------|
|                         | Average Attendance | Program Costs, $ | Average Attendance | Program Costs, $ | Ongoing Costs, $ |
| Educational classes    | 1.7                  | 15,995           | 6                   | 1,883,361        | 941,681          |
| Exercise classes       | 1.6                  | 4,524            | 7                   | 513,396          | 256,698          |
| Counseling sessions    | 1.9                  | 2,247            | 3                   | 366,955          | 183,477          |
| Home visits<sup>d</sup> | 7.8                  | 12,242           | 7.8<sup>a</sup>     | 2,673,319        | NA               |
| CHW training           | NA                   | 261              | NA                  | 57,155           | NA               |
| Total costs            | NA                   | 35,269           | NA                  | 5,494,185        | 1,381,856        |

Abbreviation: CHW, community health worker; NA, not applicable.

<sup>a</sup> Calculates costs based on the original sample size of 30, and the per-class attendance by participants in the sample.

<sup>b</sup> Reflects attendance levels and associated costs that are likely if the program served a larger number of people. The number used here is the number of people in the Archimedes data set who reflect the program’s target demographics.

<sup>c</sup> The annual costs beyond the formal 18-month program borne by participants as a result of lifestyle changes made during the program.

<sup>d</sup> Average number of home visits that participants received.

Table 2. Cohort Characteristics and Cost-Effectiveness Analysis, Community Health Worker Intervention for Hispanic Adults with Diabetes, October 2009–January 2010

| Characteristic | Glycemic Levels Controlled, mean (SD),<sup>a</sup> n = 18 | Glycemic Levels Not Controlled, Mean (SD)<sup>b</sup>, n = 12 |
|---------------|--------------------------------------------------------|----------------------------------------------------------|
| Sex           | Male 16                                                 | 10                                                       |
|               | Female 2                                                | 2                                                        |
| Age           | 52.06 (11.11)                                           | 48.82 (10.99)                                            |
| Characteristic                                      | Glycemic Levels Controlled, mean (SD), n = 18 | Glycemic Levels Not Controlled, Mean (SD), n = 12 |
|----------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Baseline A1c                                       | 9.56 (2.53)                                   | 10.5 (2.39)                                   |
| Ending A1c                                         | 6.29 (0.40)                                   | 8.55 (1.33)                                   |
| Home visits                                        | 8.61 (5.57)                                   | 6.58 (6.08)                                   |
| Attended classroom education                       | 7.56 (3.48)                                   | 9.33 (9.04)                                   |
| Attended exercise classes                          | 3.33 (3.12)                                   | 3.08 (3.06)                                   |
| Attended counseling sessions                       | 1.5 (2.33)                                    | 1.33 (2.35)                                   |

Abbreviation: SD, standard deviation; A1c, hemoglobin A1c.

*Presented as frequencies.

Table 3. Expected Outcomes by Age Group for Participants Receiving Intervention, Community Health Worker Intervention for Hispanic Adults with Diabetes, October 2009–January 2010

| Disorder                  | Standard Care, % | Absolute Difference over 20 y, % |
|---------------------------|------------------|----------------------------------|
|                           | 30-49 y          | 50-64 y                          | 65-84 y                          | All Ages | 30-50 y | 50-65 y | 65-84 y | All Ages |
| Bilateral blindness       | 3.30             | 3.56                             | 4.73                             | 3.87      | -0.32    | 0.05     | -0.03    | -0.08    |
| CHD death                 | 2.94             | 3.64                             | 5.39                             | 4.02      | -0.40    | -0.40    | -0.82    | -0.54    |
| Death                     | 19.30            | 42.53                            | 81.50                            | 48.84     | -0.49    | -0.72    | -0.37    | -0.55    |
| ESRD                      | 0.30             | 1.84                             | 18.04                            | 6.70      | 0.00     | 0.05     | 0.92     | 0.32     |
| Foot amputation           | 17.39            | 18.00                            | 18.09                            | 17.86     | -3.81    | -3.69    | -2.92    | -3.47    |
| Foot ulcer                | 46.94            | 45.37                            | 33.43                            | 41.92     | -6.68    | -6.22    | -3.95    | -5.60    |
| FPG                       | 11.65            | 7.57                             | 9.24                             | 3.10      | -2.28    | -1.38    | -1.62    | -0.58    |
| MI                        | 13.43            | 22.81                            | 23.63                            | 20.48     | -1.69    | -2.75    | -3.20    | -2.60    |
| PDR                       | 46.46            | 44.79                            | 41.16                            | 44.06     | -3.69    | -1.95    | -0.60    | -1.99    |

Abbreviations: CHD, coronary heart disease; ESRD, end stage renal disease; FPG, fasting plasma glucose; MI, myocardial infarction; PDR, proliferative diabetic retinopathy.

*Absolute difference between standard care and care received through intervention over a 20-year period.

Table 4. Incremental Cost-Effectiveness, Community Health Worker Intervention for Hispanic Adults with Diabetes, October 2009–January 2010

| Age Range     | 30-49 y | 50-64 y | 65-84 y | All Ages |
|---------------|---------|---------|---------|----------|
| Life years    | 69.96   | 150.54  | 193.20  | 413.52   |
| Undiscounted QALYs | 133.70  | 225.84  | 204.23  | 563.64   |
| QALYs, discounted 3% | 90.92   | 157.15  | 146.92  | 394.92   |
| Cost per QALY – 20 y, $ | 39,021  | 30,786  | 33,103  | 33,319   |
| Cost per QALY – 10 y, $ | NA      | NA      | NA      | 56,009   |
| Cost per QALY – 5 y, $ | NA      | NA      | NA      | 130,272  |
