Supplemental Table S1. Population characteristics derived from the REACH trial at 18 months post intervention and for the initiation of model simulation

Variable name and definition		Trial-derived data			Model-simulated data		
		EUC	CHW-only	CHW+PL	EUC	CHW-only	CHW+PL
Demographic characteristics							
Age (years)	Mean (SD)	50.4 (10.6)	50.4 (10.6)	50.4 (10.6)	50.4 (10.6)	50.3 (10.6)	50.4 (10.7)
Male	%	39.2	39.2	39.2	38.3	38.9	38.8
Duration of diabetes (years)	Mean (SD)	7.4 (5.7)	7.4 (5.7)	7.4 (5.7)	7.6 (5.2)	7.6 (5.3)	7.6 (5.3)
BMI (kg/m^2)[1]	Mean (SD)	32.3 (6.0)	32.3 (6.0)	32.3 (6.0)	32.4 (5.8)	32.4 (5.8)	32.4 (5.9)
Risk factors							
HbA1c (%)	Mean (SD)	8.01 (2.1)	7.82 (1.9)	7.24 (1.8)	7.99 (2.0)	7.85 (1.9)	7.24 (1.8)
HDL cholesterol (mmol/L)[1]	Mean (SD)	1.03 (0.30)	1.03 (0.30)	1.03 (0.30)	1.03 (0.29)	1.03 (0.3)	1.03 (0.3)
LDL cholesterol (mmol/L)	Mean (SD)	2.48 (0.92)	2.25 (0.89)	2.16 (0.81)	2.48 (0.91)	2.25 (0.87)	2.17 (0.8)
Triglycerides (mmol/L)[2]	Mean (SD)	2.36 (1.02)	2.36 (1.02)	2.36 (1.02)	2.36 (1)	2.34 (1)	2.36 (0.99)
SBP (mmHg)	Mean (SD)	130.4 (13.6)	132.5 (14.0)	127.4 (16.8)	130.2 (13.5)	132.8 (13.97)	127.4 (16.85)
DBP (mmHg)	Mean (SD)	78.4 (7.4)	78.6 (10.5)	76.3 (11.2)	78.2 (6.5)	78.9 (9.3)	76.33 (9.9)
Current smoker[3]	%	31.3	31.3	31.3	31.3	31.1	31.6
Disease status							
History of angina (with angina history, but without MI or heart failure history)[4]	%	6.2	6.2	6.2	6.6	6.0	6.3
History of heart failure with no MI (with heart failure history, but without MI history)[4,5]	%	2.3	2.3	2.3	2.3	2.5	2
History of revascularization procedure (CABG or PCI) with no MI (with CABG or PCI history, but without MI history)[4]	%	0	0	0	0	0	0
History of MI with no heart failure (with MI history, but without health failure history)[4,5]	%	2.7	2.7	2.7	2.6	2.7	2.5
History of MI and heart failure (with MI and heart failure history)[4,5]	%	5.4	5.4	5.4	5.1	5.5	5.4
History of stroke (alive with stroke history)[4]	%	5.8	5.8	5.8	5.8	5.7	6.3
Microalbuminuria (30 mg/g ≤ UACR < 300 mg/g)[4]	%	12.4	12.4	12.4	12.6	13	12.2
Proteinuria (UACR ≥ 300 mg/g)[4]	%	4.5	4.5	4.5	4.6	4.5	4.6
ESRD – dialysis (ESRD with need of dialysis but no history of transplant)[6]	%	0.9	0.9	0.9	1	0.9	1
ESRD – transplant (ESRD with history of transplant)[4]	%	0	0	0	0	0	0
Clinical neuropathy (distal symmetric (sensory) neuropathy)[6]	%	47.5	47.5	47.5	47.1	47.2	48.2
Amputation due to diabetic neuropathy[6]	%	0.5	0.5	0.5	0.4	0.4	0.5
Non-proliferative retinopathy (left eye)[4]	%	18.1	18.1	18.1	18.1	18.2	18.1
Proliferative retinopathy (left eye)[4]	%	0	0	0	0	0	0
Macular edema (left eye)[4]	%	0	0	0	0	0	0
Blindness (left eye)[4]	%	0	0	0	0	0	0
Non-proliferative retinopathy (right eye)[4]	%	18.1	18.1	18.1	17.7	18	17.6
Proliferative retinopathy (right eye)[4]	%	0	0	0	0	0	0
Macular edema (right eye)[4]	%	0	0	0	0	0	0
Blindness (right eye)[4]	%	0	0	0	0	0	0
Medications	%						
Diet and exercise only[7]	%	6.9	6.9	6.9	7.1	7	6.8
Single non-insulin med (e.g., metformin only)[7]	%	30.6	30.6	30.6	30.3	31	30.5
Two or more non-insulin meds (e.g., metformin + sulfonylureas)[7]	%	27.8	27.8	27.8	28.5	28.1	27.7
Basal insulin[9,10] only (basal insulin or NPH)[7,8]	%	34.7	34.7	34.7	34.2	33.9	35
Intensive bolus insulin[9,10]	%	0	0	0	0	0	0

(1. Basal insulin + rapid-acting or short-acting insulin; or 2. NPH + rapid-acting or short-acting insulin; or 3. Premixed insulin)[7,8]							
Beta-blocker (whether a subject is taking beta-blocker)[7]	%	5.6	5.6	5.6	5.4	5.3	5.6
ACE inhibitor (whether a subject is taking ACE inhibitor)[7]	%	40.7	40.7	40.7	40.3	40.8	40.2
Statin (whether a subject is taking statin)[7]	%	35.2	35.2	35.2	34.4	35.3	35
Aspirin (whether a subject is taking aspirin)[3]	%	9.0	9.0	9.0	8.9	9	8.9

Abbreviations: EUC, enhanced usual care; CHW, community health worker; PL, peer leader; SD, standard deviation; BMI, body mass index; HbA1c, glycated hemoglobin; HDL, high density lipoprotein; LDL, low density lipoprotein; SBP, systolic blood pressure; DBP, diastolic blood pressure; MI, myocardial infarction; CABG, coronary artery bypass grafting; PCI, percutaneous coronary intervention; UACR, urine albumin-to-creatinine ratio; ESRD, end-stage renal disease; NPH, neutral protamine Hagedorn; ACE, angiotensin-converting enzyme.

[1]There were no intervention effects on these variables, and thus we assumed that at 18 months, each study group had the same values which were derived from the whole study cohort at 18 months.

[2]Triglycerides were not assessed in the study, and we used total cholesterol, HDL, and LDL to calculate triglycerides. We assumed that there were no intervention effects on triglycerides, and thus at 18 months, each study group had the same values which were derived from the whole study cohort at 18 months.

[3]These variables were not assessed at 18 months, and thus we assumed that they did not change from baseline to 18 months, and at 18 months, each study group had the same values which were derived from the whole study cohort at baseline.

[4]These variables were not assessed in the study, and we assumed that each study group either had 0% patients or had the same values which were derived from the Hispanic population in NHANES 2009-2012.

[5]We assumed that 70% of patients with heart failure had a history of myocardial Infarction.

[6]We assumed that there were no intervention effects on these variables, and thus at 18 months, each study group had the same values which were derived from the whole study cohort at baseline.

[7]There were no intervention effects on medication intensification, and thus we assumed that at 18 months, each study group had the same values which were derived from the whole study cohort at 18 months.

[8]Individual percentage of patients who used basal insulin only or used intensive bolus insulin was not known, and thus we assumed that all patients who used insulin were using basal insulin only.

[9]Insulin products:

a) Rapid-acting insulin: [a] Insulin aspart (Novolog), [b] Insulin glulisine (Apidra), [c] Insulin lispro (Humalog), [d] Insulin inhalation [Afrezza]
b) Short-acting insulin (regular insulin): [a] Human regular (Humulin R, Novolin R)
c) Intermediate-acting insulin: [a] Human NPH (Humulin N, Novolin N)
d) Basal insulin: [a] Insulin detemir (Levemir), [b] Insulin glargine (Lantus; Toujeo; Basaglar), [c] Insulin degludec [Tresiba]
e) Premixed insulin: [a] Novolin 70/30 (70% NPH, human insulin isophane susp and 30% regular human insulin), [b] Novolog Mix 70/30 (70% insulin aspart protamine susp and 30% insulin aspart), [c] Humalog Mix 75/25 (75% insulin lispro protamine susp and 25% insulin lispro), [d] Humalog Mix 50/50 (50% insulin lispro protamine susp and 50% insulin lispro), [e] Humulin 70/30 (70% insulin aspart protamine susp and 30% insulin aspart)

[10]Additional instructions to set up 5 variables of medications for anti-dysglycemia treatment in MMD:

a) If a subject is on insulin therapy (with or without non-insulin medications) in which only basal insulin or only NPH is used, s/he should be considered at the 4th stage treatment for dysglycemia, and therefore only the variable BasalInsulin is set to be 1.
b) If a subject is on insulin therapy (with or without non-insulin medications) in which any of rapid-acting insulin, short-acting insulin, or premixed insulin is used, s/he should be considered at the 5th stage treatment for dysglycemia, and therefore only the variable Insulin is set to be 1.

Supplemental Table S2. Per-participant cost related to the interventions over the 18-month period of the REACH trial

Cost type	Item or activity related to the interventions	Per-participant cost					
		EUC (n=73)		CHW-only (n=89)		CHW+PL (n=60)	
		Time (hr)	Cost ($)	Time (hr)	Cost ($)	Time (hr)	Cost ($)
Identification of peer leaders	Recruitment of peer leaders	—	$0	—	$0	0.33	$6.54
Implementation and maintenance of the interventions							
Staff time contributed by community health workers (CHWs)[1]	Doctor's office – routine care	—	$0	1.64	$32.19	1.64	$32.19
	Home visit	—	$0	2.12	$41.62	2.12	$41.62
	Translating	0.21	$4.13	0.21	$4.13	0.21	$4.13
	FHA training – (JTH program)	—	$0	0.36	$7.10	0.36	$7.10
	JTH class preparation - before teaching	—	$0	3.79	$74.48	3.79	$74.48
	Teaching – (JTH program-group)	—	$0	14.7	$287.89	14.7	$287.89
	Making a referral	0.06	$1.14	0.06	$1.14	0.06	$1.14
	E-mails or phone calls to clients	4.25	$83.30	4.25	$83.30	4.25	$83.30
	Mailings	3.24	$63.50	3.24	$63.50	3.24	$63.50
	Driving – for CHW interventions	—	$0	3.17	$62.26	3.17	$62.26
	Teaching – (JTH program-1:1)	—	$0	2.88	$56.54	2.88	$56.54
	2-hour HCP session	2.00	$39.24	—	$0	—	$0
	FHA training – (PL for progress)	—	$0	—	$0	0.35	$6.78
	Teaching – for PL interventions	—	$0	—	$0	3.24	$63.46
	Driving – for PL interventions	—	$0	—	$0	7.88	$154.61
	PL preparation – before session	—	$0	—	$0	3.78	$74.12
	PL training	—	$0	—	$0	0.67	$13.08
	PL booster sessions	—	$0	—	$0	0.60	$11.77
Stipends for peer leaders (PLs)[2]	PL training	—	$0	—	$0		$76.67
	PL support interventions	—	$0	—	$0		$260.00
Materials for the educational or training[3]	Copies/printing materials for participants		$18.02		$18.02		$18.02
	Copies/printing materials for PL interventions		$0		$0		$33.33
Total (2009-2013 US$)			$209.33		$732.17		$1,432.53
Total (2018 US$)[4]			$234		$820		$1,599
Intervention costs for sensitivity analyses							
50% reduction of intervention costs					$410		$800
50% increase of intervention costs					$1,230		$2,399

Abbreviations: REACH, Racial and Ethnic Approaches to Community Health; EUC, enhanced usual care; CHW, community health worker; PL, peer leader; hr, hour; FHA, family health advocate; JTH, Journey to Healthy; HCP, Health Care Plus.

[1]The time estimates contributed by CHWs for the interventions were collected in real-time during the trial, and then the intervention time was valued based on the hourly rates with fringe benefits of CHWs to obtain the intervention costs. The average hourly rates with fringe benefits of a CHW were $19.62 during the study period of years 2009-2013.

[2]Five PLs completed 46 hours of the training and were each paid $20 per hour for the training. During a 12-month period (from month-7 to month-18), the five PLs each were paid $60 per week for their efforts to provide support interventions such as making calls to participants, facilitating the support groups, and attending the booster sessions.

[3]Total material and copy costs for participants for the interventions were estimated as $4,000 and the additional material and copy costs for participants for the PL intervention were estimated as $2,000.

[4]The costs were inflated to 2018 US$.

Supplemental Table S3. Costs of complications for Michigan Model for Diabetes

	2018 US dollars[b]		Sources
	Event	Ongoing	
Baseline cost[a]	NA	2,461	[1]
Retinopathy			
Non-proliferative retinopathy	109	109	[2]
Macular edema or proliferative retinopathy	1,170	109	[2]
Blindness	3,137	3,137	[3]
Nephropathy			
Microalbuminuria	465	465	[4]
Proteinuria	795	795	[4]
End-stage renal disease with hemodialysis	105,293	105,293	[5]
End-stage renal disease with renal transplant	146,779	47,127	[5]
Neuropathy			
Clinical neuropathy	543	543	[2]
Amputation	45,636	1,595	[2]
Cardiovascular disease			
Angina	8,804	2,274	[2]
Myocardial infarction	44,377	2,452	[2]
Percutaneous transluminal coronary angioplasty[c]	8,804	2,274	[2]
Coronary artery bypass graft[c]	64,512	2,452	[2]
Myocardial infarction with coronary artery bypass graft[c]	64,512	2,452	[2]
Congestive heart failure	36,819	8,101	[6]
Ischemic stroke	58,764	19,611	[2]
Acute metabolic complication			
Hypoglycemia requiring hospitalization	18,063	NA	[3]
Death, by age in years			
74 or younger	79,492	NA	[7]
75-84	64,611	NA	[7]
85 or older	43,752	NA	[7]

NA, not applicable.

[a]The baseline cost is the annual direct medical cost for a white man with type 2 diabetes and body mass index of 30 kg/m^2 who is treated with diet and exercise and has no microvascular, neuropathic, or cardiovascular complications.

[b]Costs are expressed in year 2018 US dollars using the Personal Consumption Expenditures-Health price index to reflect inflation.

[c]About one third of patients undergoing percutaneous coronary intervention (PCI) in the US have diabetes and about 35% of coronary artery bypass grafting (CABG) patients have diabetes. Also, it was estimated that in the US in 2010, 492,000 patients underwent PCI while 219,000 underwent CABG. With calculations using these data, we could have that the estimated number of diabetic patients treated with PCI in 2010 in the US would be 164,000 (=492,000*1/3), while that treated with CABG would be 76,650 (=219,000*0.35). Thus, based on these estimates, we would assume that about 68% of diabetic patients who need coronary revascularization procedures may use PCI, while 32% of them may get CABG.

References:

1. Brandle M, Zhou H, Smith BR, et al. The direct medical cost of type 2 diabetes. Diabetes Care 2003;26:2300-4.
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5. U.S. Renal Data System, USRDS 2013 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2013.
6. Liao L, Jollis JG, Anstrom KJ, et al. Costs for heart failure with normal vs reduced ejection fraction. Arch Intern Med 2006;166:112-8.
7. Data were from email consultation with Dr. Christopher Hogan on March 19, 2015, who is the president of Direct Research, LLC in Vienna, VA. These costs of death were the incremental per capita medical payments between the diabetes survivors in 2012 (costs in the year of 2012) and the diabetes decedents in 2012 (costs in the last 12 months of life) who were Medicare fee-for-service beneficiaries with Part A and Part B enrollment and with any diagnosis of diabetes on any physician or hospital (inpatient or outpatient) claims in 2011 and 2012.

Supplemental Table S4. Impact inventory for components considered in the cost-effectiveness analyses

Type of impact	Included in the reference case analysis from each perspective		Notes on sources of evidence
	Health care sector	Societal	
Formal health care sector			
Health			
Health outcomes (effects)			
Longevity effects	Yes	Yes	REACH Detroit trial, MMD
Health-related quality-of-life effects	Yes	Yes	MMD (utilities from published literature)
Other health effects	No	No	
Medical costs			
Paid for by third-party payers	Yes	Yes	REACH Detroit trial (intervention costs), MMD (costs from published literature)
Paid for by patients out-of-pocket	Not available	Not available	
Future related medical costs	Yes	Yes	MMD (costs from published literature)
Future unrelated medical costs	Not available	Not available	
Informal health care sector			
Health			
Patient-time costs	Not applicable	Not available	
Unpaid caregiver-time costs	Not applicable	Not available	
Transportation costs	Not applicable	Not available	
Non–health care sectors			
Productivity	Not applicable	Not available	
Consumption	Not applicable	Not available	
Social services	Not applicable	Not available	
Legal or criminal justice	Not applicable	Not available	
Education	Not applicable	Not available	
Housing	Not applicable	Not available	
Environment	Not applicable	Not available	

Abbreviations: REACH, Racial and Ethnic Approaches to Community Health; MMD, Michigan Model for Diabetes.

Supplemental Table S5. Sensitivity analyses for estimating the cost-effectiveness of the CHW+PL vs. EUC interventions by varying intervention costs and treatment effects of the CHW+PL intervention

	CHW+PL vs. EUC		
	Incremental total cost, $	Incremental QALY	ICER, $
Base-case analysis (20-year simulation)[1]	$796	0.0276	$28,796
50% reduction of CHW+PL intervention costs[2]	-$3	0.0276	Cost saving
50% increase of CHW+PL intervention costs[2]	$1,596	0.0276	$57,715
Decrease CHW+PL treatment effect on HbA1c by 1 SE[3]	$768	0.020	$37,600
Increase CHW+PL treatment effect on HbA1c by 1 SE[3]	$603	0.033	$18,389
Decrease CHW+PL treatment effect on LDL by 1 SE[4]	$951	0.021	$45,948
Increase CHW+PL treatment effect on LDL by 1 SE[4]	$551	0.032	$17,073
Decrease CHW+PL treatment effect on SBP by 1 SE[5]	$852	0.018	$46,092
Increase CHW+PL treatment effect on SBP by 1 SE[5]	$519	0.035	$14,969

Abbreviations: CHW, community health worker; PL, peer leader; EUC, enhanced usual care; QALY, quality-adjusted life year; ICER, incremental cost-effectiveness ratio; HbA1c, glycated hemoglobin; LDL, low density lipoprotein; SBP, systolic blood pressure; SE, standard error.

[1]The base-case analysis was from the healthcare sector perspective over a 20-year simulation time horizon for the cost-effectiveness of the REACH Detroit trial interventions, which assumed the diminishing intervention effects after the end of the trial.

[2]We assumed a 50% reduction ($800) or increase ($2,399) of the CHW+PL intervention costs ($1,599).

[3]Mean HbA1c level at simulation baseline remained unchanged (7.66%) for the EUC group, and was increased to 7.054% and decreased to 6.366% for CHW+PL group for the two sensitivity analysis scenarios.

[4]Mean LDL level at simulation baseline remained unchanged (2.47 mmol/L) for the EUC group, and was increased to 2.38 mmol/L and decreased to 1.94 mmol/L for CHW+PL group for the two sensitivity analysis scenarios.

[5]Mean SBP level at simulation baseline remained unchanged (130.4 mmHg) for the EUC group, and was increased to 130.3 mmHg and decreased to 124.5 mmHg for CHW+PL group for the two sensitivity analysis scenarios.