Online Appendix Supplementary Material for:
Screening Adults for Prediabetes and Diabetes May be Cost-Saving

Cost assessment:

Costs were expressed in 2007 dollars. Health system costs were assessed from a CMS-as-payer perspective – thus reflecting the types and levels of costs that would be incurred in the Medicare fee for service program – and compared with VA costs, to provide a single-payer perspective. Included were the direct medical costs associated with screening, the costs of false negatives, and the costs for true positive cases of prediabetes and diabetes. Societal costs included both the direct medical and direct non-medical costs of testing, direct and indirect (lost labor productivity) costs of false negatives, and direct medical, direct non-medical, and indirect costs of true positives. Base case assumptions are outlined below. Cost components for these analyses are provided in more detail in this online appendix.

Costs of testing:

CMS-based direct costs of testing included costs for laboratory tests, cost of the GCT glucose drink, and staff costs (5 minutes of staff time was added to the cost of GCT-cap and GCT-pl for administration of the glucose drink and capillary glucose testing). It was assumed that blood for GCT-pl, RPG, and the OGTT would be drawn at an on-site laboratory. The direct non-medical costs of testing reflected excess time spent by the patient. Since screening was assumed to be opportunistic – during a visit – the visit time was not included.

Capillary testing was assumed to take an extra 5 minutes and plasma testing 15 minutes. The OGTT would require an extra visit and was assumed to take 3.25 hours. The value of patient time was estimated conservatively to be half the average wage for all occupations in the US as determined by the Bureau of Labor Statistics in 2007 ($9.42).

Costs of false negatives:

For the base case analyses, the cost of a false negative – prediabetes or diabetes that was undetected – was evaluated as 10% of the projected marginal three-year medical costs for that condition, assuming that marginal costs could be decreased by appropriate management, as they were in the DPP (1, 2). In the DPP, treatment with metformin and lifestyle changes reduced medical costs outside of the study by 5%-9%, respectively, compared to the placebo arm (1). Since the DPP participants all had prediabetes and all were receiving medical follow-up through the study, the probable cost impact would likely be greater in the general population – in which cases of both prediabetes and diabetes would be missed, and in which close medical care for missed diagnoses would be lacking; 10% of projected costs was assigned as a reasonable amount that might be reduced by detection of the condition, although no studies have been done to determine the actual cost impact. A 3-year time period for the estimation of cost was chosen, as this is the period over which DPP costs were calculated and is also the time between ADA-recommended screenings. This time period might also be relevant to employer-based health insurance providers, who provide coverage to employees often for short periods of time, due to employee turnover.

The cost of a false negative was assumed to include the three-year direct medical cost of diabetes, prediabetes, and/or prediabetes that progressed to diabetes. Direct medical costs for diabetes were based on Medical Expenditure Panel Survey costs from 2000-2004 which were found to be $4,174/year in 2005 dollars for a 50-year old person with new-onset diabetes compared to a similar person without diabetes (3). Patients with IFG_{110} in Kaiser Permanente Northwest had marginal direct medical costs of $1316/year (4), and this was used for all patients

with prediabetes [although IGT might incur higher costs because of higher cardiovascular risk (5, 6)]. We projected a 5%/year risk for progression to diabetes for IFG_{110} or IGT, and a 10%/year risk for IFG+IGT (7), and prorated prediabetes costs to include increased costs for those who developed diabetes.

Indirect costs for false negatives (from absenteeism, reduced productivity at work, and reduced productivity for those that did not work) were derived from the ADA 2007 economic assessment and were attributed only to those with diabetes or whose prediabetes progressed to diabetes during the 3 years (8). For patients <45 years of age (assumed to be in early stages of diabetes), this was $2,348/year, and was adjusted for the risk of progression to diabetes for each prediabetic state; 10% of this cost was used in the base case, again assuming this to be a reasonable fraction of cost that might be reduced with detection of the condition.

Costs of True Positives

Direct medical costs for a true positive for our base case analyses were based on three-year costs for the DPP metformin group, where marginal costs for laboratory tests, physician visits, and follow-up were $703 (2); we substituted current generic costs for metformin 850mg twice a day. Direct medical costs incurred outside of the study, direct non-medical costs, and indirect costs for the DPP metformin vs. placebo arms were used as other components for the cost of true positives (2); direct medical costs outside the study were -$329 for the metformin vs. placebo arms. Societal costs included three-year direct non-medical costs (-$11) and indirect costs ($278) in the metformin vs. placebo arms.

References

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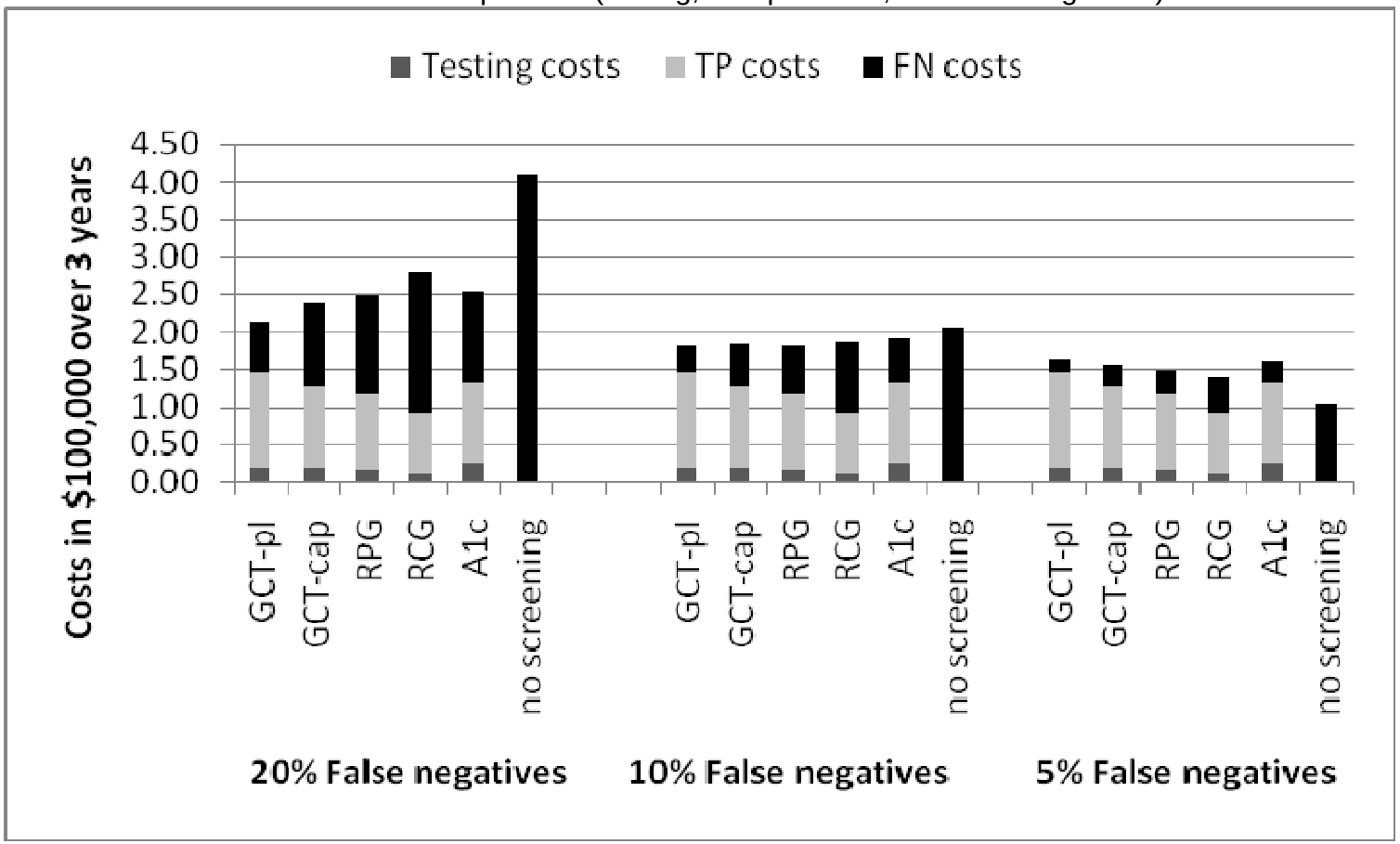
Table A1. Base Case Cost components for a 3 year period

Type of cost	Cost components	Type of test					
	Testing costs	**GCT-pl**	**GCT-cap**	**RPG**	**RCG**	**A1c**	**OGTT**
Direct	Medicare test	$6.64**	$3.27	$5.48	$3.27	$13.56	$17.99
Direct	Medicare glucose drink	included	$2.35	none	none	none	included
Direct	Staff time (Medicare)#	$1.13	$1.13	included	included	included	none
Health system	**Medicare total direct costs**	**$7.77**	**$6.75**	**$5.48**	**$3.27**	**$13.56**	**$17.99**
Direct	VA test	$2.79	$0.33	$2.79	$0.33***	$7.66	$6.73
Direct	VA glucose	$1.15	$1.15	none	none	none	included
Direct	Staff time (VA)#	$1.13	$1.13	included	1.13	included	none
Health system	**VA total direct costs**	**$5.07**	**$2.61**	**$2.79**	**$1.46**	**$7.66**	**$6.73**
Non-medical	Patient time (Medicare and VA)%	$2.36	$0.79	$2.36	$0.79	$2.36	$30.62
Societal	**Medicare direct+non-medical costs**	**$10.13**	**$7.54**	**$7.84**	**$4.06**	**$15.92**	**$48.61**
Societal	**VA direct+non-medical costs**	**$7.43**	**$3.40**	**$5.15**	**$2.25**	**$10.02**	**$37.35**
	10% False negative costs	**Condition detected**				**DPP-FN* Prediabetes**	**DPP-FN* Diabetes**
		IFG110	**IGT**	**IFG+IGT**	**DM**		
Direct	Direct medical (due to prediabetes and progression to diabetes)	$485	$485	$570	$1,329	$329	$658
Indirect	Reduced productivity (due to progression to diabetes)	$68	$68	$132	$704	$68	$136
Health system	**Direct medical costs**	**$485**	**$485**	**$570**	**$1,329**	**$329**	**$658**
Societal	**Direct + Indirect costs**	**$553**	**$553**	**$701**	**$2,034**	**$397**	**$794**
	True positive costs	**IFG110**	**IGT**	**IFG+IGT**	**DM**	**VA-TP†**	
Direct	Generic metformin drugs	$144	$144	$144	$144		
Direct	VA metformin drugs	$109	$109	$109	$109	$109	
Direct	Treatment-related medical care (generic and VA metformin groups)	$703	$703	$703	$703	$56	
Direct	Other medical treatment (generic and VA metformin groups)	-$329	-$329	-$329	-$329		
Health system	**Generic metformin total direct costs**	**$518**	**$518**	**$518**	**$518**		
Health system	**VA metformin total direct costs**	**$483**	**$483**	**$483**	**$483**	**$165**	
Non-medical	Patient time and lifestyle	– $10.89	– $10.89	– $10.89	– $10.89	-$3	
Indirect	Reduced productivity	$278	$278	$278	$278	$93	
Societal	**Generic metformin direct, non-medical, and indirect costs**	**$785**	**$785**	**$785**	**$785**		
Societal	**VA Metformin direct non-medical, and indirect costs**	**$751**	**$751**	**$751**	**$751**	**$255**	

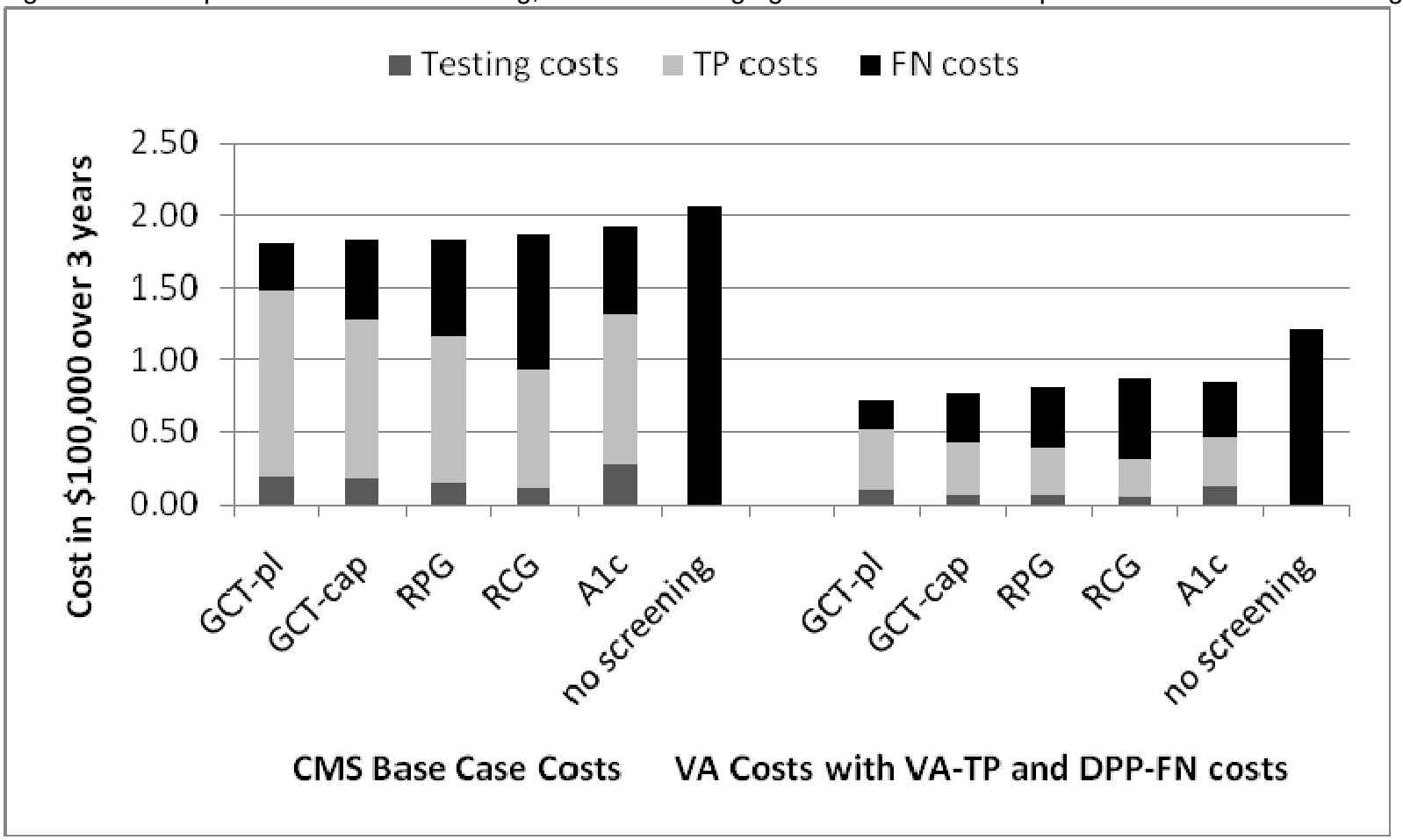
**Medicare cost for screen for gestational diabetes, which includes cost of glucose drink;
***VA RCG test costs did not include staff time;
#Staff time cost based 5 minutes of mean income for medical assistants based on Bureau of Labor services (BLS) in 2007;
% Patient time based on half the average BLS wage of all occupations in the US in 2007= $9.42/hour;
*DPP FN= false negative costs based on DPP study; †VA TP= alternative projected cost for true positives in VA system;
Medicare costs based on Centers for Medicare and Medicaid Services (CMS) reimursements from the 2007 Medicare Clinical Diagnostic Laboratory Fee Schedule(http:/www.cms.hhs.gov/ClinicalLabFeeSched/);
VA costs based on 2007 costs obtained from the Decision Suppost System (DSS).

Figure A1. Contribution of cost components for costs with different fractions of false negative costs (CMS base case costs) showing the contribution of the different cost components (testing, true positives, and false negatives) for each scenario.



TP= true positive; FN= false negative

Figure A2. Comparison of health system costs between CMS base case costs and lowest VA costs, showing the contribution of the different cost components (testing, true positives, and false negatives) for each scenario. Both analyses projected screening to be less expensive than no screening, with cost savings greater in the VA compared to the Medicare setting.



TP= true positive; FN= false negative;
DPP-FN = false negative costs based on DPP study
VA-TP = alternative true positive cost in VA system