Impact of a Patient Incentive Program on Receipt of Preventive Care

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Despite widespread efforts to encourage prevention, rates of preventive care use fall well short of recommendations.[1,2] Much of the focus on improving preventive care has been on decreasing financial barriers. For example, new laws in the United States have eliminated patient out-of-pocket costs for preventive health services.[3] While removing out-of-pocket costs will increase the number of people who receive preventive care, the increase is likely to be modest.[4,5] Employers and health plans are exploring whether patient incentive programs can spur greater use of preventive care.[6,7]

In a patient incentive program, a patient receives money or some other financial reward for healthy behavior.[7] In theory, these programs address a fundamental problem with preventive care—when making the choice to receive preventive care, patients balance the inconvenience of receiving preventive care with distant and often intangible benefits. Humans generally discount such future benefits[8,9] and therefore it may not be surprising that many patients do not seek preventive care. Incentive programs might help address this discrepancy between immediate inconvenience and future benefit by increasing the perceived immediate benefits of prevention.

There have been several randomized trials focusing on patient incentives to promote healthy behavior.[10-12] For example, Volpp and colleagues found that a $750 incentive led to a three-fold increase in the number of people able to quit smoking.[13] While important, this prior research has been limited to small clinical trials with a narrow focus, relatively short follow-up periods, and an incentive structure that may not be sustainable.[7] In this paper, we study the impact of a patient incentive program operated by a private health plan in South Africa which has been in place for over a decade and includes almost 1.5 million enrollees. In this program, receipt of preventive care services "earns" points for enrollees, and points translate into rewards such as discounted travel or cell phone minutes. We assessed the impact of enrollment in this incentive program on receipt of preventive care services by compar-

ABSTRACT

Objectives

Patient financial incentives are being promoted as a mechanism to increase receipt of preventive care, encourage healthy behavior, and improve chronic disease management. However, few empirical evaluations have assessed such incentive programs.

Study Design

In South Africa, a private health plan has introduced a voluntary incentive program which costs enrollees approximately $20 per month. In the program, enrollees earn points when they receive preventive care. These points translate into discounts on retail goods such as airline tickets, movie tickets, or cell phones.

Methods

We chose 8 preventive care services over the years 2005 to 2011 and compared the change between those who entered the incentive program and those that did not. We used multivariate regression models with individual random effects to try to address selection bias.

Results

Of the 4,186,047 unique individuals enrolled in the health plan, 65.5% (2,742,268) voluntarily enrolled in the incentive program. Joining the incentive program was associated with statistically higher odds of receiving all 8 preventive care services. The odds ratio (and estimated percentage point increase) for receipt of cholesterol testing was 2.70 (8.9%); glucose testing 1.51 (4.7%); glaucoma screening 1.34 (3.9%); dental exam 1.64 (6.3%); HIV test 3.47 (2.6%); prostate specific antigen testing 1.39 (5.6%); *Papanicolaou* screening 2.17 (7.0%); and mammogram 1.90 (3.1%) (*P* <.001 for all 8 services). However, preventive care rates among those in the incentive program was still low.

Conclusions

Voluntary participation in a patient incentive program was associated with a significantly higher likelihood of receiving preventive care, though receipt of preventive care among those in the program was still lower than ideal.

Am J Manag Care. 2014;20(6):494-501

ing the receipt of preventive services among those who joined the program to those that did not join the program.

METHODS

Setting

We analyzed the receipt of preventive care for members of the Discovery Health Plan in South Africa between 2005 and 2011. In South Africa, approximately 15% of the population, typically the most affluent, obtain private health insurance either independently or through their employer. Those with private insurance receive care from physicians and hospitals in a system entirely separate from the larger public healthcare system. In our eAppendix (available at **www.ajmc.com**), we demonstrate that those with private health plan insurance in South Africa are socioeconomically comparable to the general US population.

Our study population included both health plan members in the incentives program and those not in the incentives program. Our only exclusion criteria were those in a separate low-cost insurance product. These members were not eligible for the incentive program and because this product is targeted to the poor, the enrollee population is very different.

Patient Incentives Program

The health plan's reward program focuses on encouraging both prevention and healthy behaviors. The incentive program is offered on a voluntary opt-in basis as South African law does not permit such programs to be made mandatory in a health plan product. Members must pay $17 per month for an individual or $21 per month for a family to enroll in the incentive program (approximately 5% of the cost of health plan membership). Enrollees can drop the incentive program at any time and on average, 7.5% drop out in a year.

Members of the reward program earn points for a number health behaviors such as receiving preventive care services, visiting a gym, smoking cessation, seeing a nutritionist, and buying healthier food at the grocery store. Our focus is just on receipt of preventive care services. In Table 1, we list the allocation of points for these preventive services. The points earned by receiving preventive care did not change during study period. Points translate into increasing status levels. The default status is Blue. For an individual member, status increases as follows: Bronze (15,000-34,999 points); Silver (35,000-44,999); Gold (≥45,000); and Diamond (3 consecutive years on Gold).

Take-Away Points

■ Discovery Health, a private South African health plan, has implemented a patient incentive program which rewards healthy behavior using discounts on retail goods and travel.

■ Over two-thirds of the health plan's enrollees have voluntarily chosen to pay approximately $15 per month to join the program.

■ Among those within the incentive program, we found the estimated increase in receipt of preventive services to be 3% to 8%, or a relative 19% to 97% increase.

■ Our results support the idea that patient incentive programs might be a mechanism for health plans to increase rates of preventive care.

Higher status level translates into increasing discounts on a range of goods and services from approximately 25 commercial partners in South Africa. These include store purchases, movie tickets, local and international flights, car rentals, and hotel booking. For example, the discount for 1 hotel chain was 30% and 50% for Blue and Diamond status, respectively. In 2009, the average annual value of incentives to members of the reward program was approximately $275 across all members and greater than $1500 in the highest Diamond tier.

Enrollees can sign up for the incentive program in several ways: they can sign up when they first join the health plan, or members already with the health plan can sign up with a phone call or download and submit an application form that is available online. The process of accruing points is automated and does not require members to submit any forms. For instance, when a claim for a mammogram is received by the health plan, points are automatically allocated to the patient. Rewards (discount) are either available at the time of the purchase or are paid in a check at the end of the month. During the study period, enrollees could receive the points even if they received the service ahead of what might be recommended by different guidelines. For example, some guidelines recommend a mammogram every 2 years, but if a woman in the incentive program received a mammogram yearly, she would receive the associated points each year.

For each year, we classified whether the health plan enrollee was a member of the reward program as of January 1 of that year. We used an "intention-to-treat" analysis such that a patient who enrolls in a reward program was considered to be in the reward program in all subsequent years even if they unenrolled at some point.

Measuring Receipt of Preventive Care

For each enrollee, we tracked receipt of 10 preventive care services within each calendar year. Eight preventive care services were associated with financial incentives (cholesterol testing, fasting glucose testing, human immunodeficiency virus [HIV] test, mammogram, Papanicolaou

■ **Table 1.** Receipt of Preventive Care among All Health Plan Enrollees Eligible for Preventive Service From 2005 to 2011

Preventive Care Services	Eligible Population[a]	Points Earned for Receiving Preventive Service[b]	Fraction of Eligible Population in Entire Health Plan Who Received Preventive Services %							
			Averaged Over 7 Years, %	2005, %	2006, %	2007, %	2008, %	2009, %	2010, %	2011, %
Services rewarded in incentive program										
Cholesterol test	18 years and older	1500	22.0	23.9	22.4	20.8	21.0	20.3	21.8	24.0
Glucose test	18 years and older	1500	20.5	16.3	16.6	17.4	20.7	22.5	23.9	26.1
Glaucoma screening	40 years and older	2500	22.3	23.1	22.7	21.3	21.6	22.5	22.4	22.2
Dental check-up	2 to 18 years old	2000	26.0	27.8	26.3	25.4	25.7	26.1	25.6	25.2
HIV test	18 years and older	5000	6.5	5.3	4.7	4.9	5.7	7.1	8.1	10.1
PSA test	Male, 50 years and older	2500	30.5	27.6	28.3	29.5	30.8	31.8	32.1	33.7
Papanicolaou test	Female, 16 years and older	2500	19.7	20.5	19.8	18.8	18.4	20.5	20.0	20.2
Mammogram	Female, 35 years and older	2500	13.8	10.9	11.9	12.3	16.1	14.9	15.3	15.4
Services not rewarded in program										
Colon cancer screening	50 years and older	Not applicable	0.9	1.0	1.1	1.2	1.1	0.6	0.6	0.5
Bone density scan	Female, 65 years and older	Not applicable	5.7	5.3	5.3	5.4	5.9	6.1	6.0	6.1

HIV indicates human immunodeficiency virus; PSA, prostate-specific antigen.
[a]This is the eligible population for earning the points in the incentive program. For services not rewarded in the program, we used the US Preventive Task Force guidelines.
[b]Points translate into increasing status levels. Default is Blue level. For an individual member, status increaseas as follow, Bronze 15,000 – 34,999 points; Silver 35,000- 44,999; Gold ≥45,000 and Diamond –3 consecutive years on Gold. As described in methods, points can be earned for a wide variety of other services such as going to the gym or buying healthier food at the grocery store. Patients in incentive program earn an additional 1500 points if the value of the cholesterol or glucose test is in the normal range. We cannot track the value of the test for those not in the incentive program.

[Pap] test, dental screening, glaucoma screening, and prostate specific antigen test). Two preventive care services were not associated with financial incentives (colon cancer screening and bone density scan for osteoporosis). We tracked the 2 nonincentivized services because there is concern that financial incentives may lead enrollees to neglect nonincentivized services.[14] Although it is associated with an incentive, we did not track receipt of the influenza vaccine, because many enrollees receive the vaccine in the workplace or pay out of pocket and therefore it is not accurately tracked in the health plan claims. We also did not track human papillomavirus and pneumococcal vaccinations, because incentives for these preventive services began in 2010. Lastly, we did not track receipt of childhood vaccinations. As described below, we examined the likelihood of receiving a preventive service before and after entry into the program. Such a model cannot be used for services only offered during a narrow age period. For each service, the health plan designates age and gender eligibility for incentive program members to claim points (Table 1). Preventive care services were identified by relevant billing and diagnosis codes in health plan claims.

Health plan members must first visit a general practitioner to receive 6 of the 10 preventive services. For 3 services (cholesterol screening, glucose testing, and HIV test), health plan members can also get these tests without a physician's order at a pharmacy or on wellness days at work sites. For dental screening, patients go directly to a dentist. As of 2006, South Africa law mandates that the 8 preventive services, except for dental screening and glaucoma screening, be provided without any patient co-payment. In 2005, coverage for preventive services varied by type of health plan. We did a sensitivity analysis in which we eliminated 2005 data.

In our analyses, we examined the receipt of a preventive service within a single year. Many preventive services such as breast or cervical cancer screening are not indicated yearly. The percentages reported are therefore not indicative of what fraction of the population is up to date with preventive care.

Measuring Utilization of Health Services by Health Plan Members

We tracked the number of visits to a general practitioner and whether the enrollee had 1 of 20 chronic illnesses.

The chronic illnesses were identified by a diagnosis on an outpatient or inpatient claim or whether the patient filled a prescription for a medication related to that illness (diagnoses listed in **eAppendix D**). Chronic illness data was only available from the health plan from 2008 through 2011.

Study Design

We estimated the association between incentive program membership and receipt of preventive care services using an individual random-effects logistic regression. We used a separate regression for each preventive care service. The unit of analysis is each enrollee time year. The dependent variables are 10 dichotomous variables denoting the annual receipt of each preventive care service. The key explanatory variable is a dichotomous variable denoting whether a given enrollee was enrolled in the incentive program for that year. This allows us to compare those who entered the incentive program versus those that are not. The other explanatory variables are gender, age (in years), dummy variables for type of health plan product (eg, high-deductible plan), and dummy variables for each calendar year from 2005 to 2011. We included a random effect for each enrollee in the analysis. The analyses were limited to the relevant population eligible for the preventive service based on age and gender (Table 1). For example, the model for mammogram analyzes only included women aged over age 35 years in the model. We ran separate models for all enrollees, enrollees with and without a chronic illness, and enrollees younger than and older than 50 years.

Because this is an observational study, we had to address selection bias. Those who chose to enter the incentive program were different on both observed and unobserved patient traits. In our main analyses, we used random patient effects to try and address this bias. There was controversy about the use of fixed-effect versus random-effect models and therefore we use a fixed-effect model as a sensitivity analysis. While a fixed-effect model might be viewed as having greater internal validity, it might have less external generalizability. For dichotomous variables, identification using fixed-effect or conditional logistic models was restricted to the relatively small group of "switchers" whose outcome measure (ie, annual take-up of a preventive care service) changed between years.

In sensitivity analyses, we limited our study population to those continuously enrolled in the health plan over the 7-year period. The goal of this sensitivity analysis was to address the possibility that the changing composition of the population might bias the results because those who were not screened tended to drop out of the program at higher rates.

Standard errors are estimated using the Eicker-Huber-White sandwich estimator.[15] All statistical analyses are conducted in STATA 12.0 (StataCorp, College Station, Texas).

RESULTS

Of the 4,186,047 unique individuals enrolled in the health plan between 2005 to 2011, 65.5% (2,742,268) of them enrolled in the incentive program at some point. Enrollment in the health plan and the incentive program steadily increased during the study period. In 2005 there were 1.83 and 1.26 million people in the health plan and incentive programs, respectively. Enrollees in the incentive program were younger and healthier (**Table 2**). For example, among enrollees in the incentive program and those not in the incentive program, the fraction that was 71 years and older was 1.0% and 7.0%, respectively. Among enrollees in the incentive program and those not in the incentive program, the fraction with no chronic illness was 81.5% and 74.7%, respectively. The fraction of the eligible population that received a given preventive service was generally low in a given year (Table 1). For example, only 13.8% of women 35 years and older received a mammogram.

Becoming a member of the incentive program was associated with an increased likelihood of receiving all 10 of the preventive services e tracked (**Table 3**). Among the 8 preventive care services associated with a financial incentive, the odds ratio (OR) for receipt of cholesterol testing was 2.70; glucose testing, 1.51; glaucoma screening, 1.34; dental check-up, 1.64; HIV testing, 3.47; PSA testing, 1.39; Pap test, 2.17; and mammogram, 1.90 (P <.001 for all 8 services). Among the 2 preventive care services not associated with a financial incentive, the OR for receipt of colon cancer screening was 1.30 and bone density scan was 1.25 (both P <.001).

From our models, we estimated the marginal effect of the incentive program on receipt of the preventive services (**Figure**). The percentage-point improvement in receipt of preventive services for cholesterol testing was 8.9%; glucose testing, 4.7%; glaucoma screening, 3.9%; dental exam, 6.3%; HIV test, 2.6%; PSA test, 5.6%; Pap test, 7.0%; and mammogram, 3.1%. This translated into a relative percentage increase from 19.3% (PSA test) to 97.4% (HIV test) increase in preventive care use.

We looked at the impact of the incentive program among subgroups of the population. Compared with enrollees older than 50 years, those 50 years or younger in the incentive program had higher ORs for most of

■ **Table 2.** Comparison of Health Plan Enrollees in Financial Incentive Program and Those Not in Program in 2008[a]

	Enrollees in Financial Reward Program in 2008 N = 1,317,654		Enrollees Not in Financial Reward Program in 2008 N = 762,730		P[b]
	Number of Enrollees (percent)				
Sex					
Male	653,907	(49.6%)	364,132	(47.7%)	<.001
Female	663,747	(50.4%)	398,598	(52.3%)	
Age[c] (years)					
0-10	261,684	(19.9%)	123,204	(16.2%)	<.001
11-18	144,981	(11.0%)	77,500	(10.2%)	
19-30	273,053	(20.7%)	127,386	(16.7%)	
31-40	276,447	(21.0%)	118,049	(15.5%)	
41-50	187,367	(14.2%)	101,448	(13.3%)	
51-60	114,303	(8.7%)	90,634	(11.9%)	
61-70	46,237	(3.5%)	71,320	(9.4%)	
71+	13,582	(1.0%)	53,189	(7.0%)	
Number of chronic conditions					
0	1,074,141	(81.5%)	569,899	(74.7%)	<.001
1-2	218,248	(16.6%)	156,833	(20.6%)	
3+	25,265	(1.9%)	35,998	(4.7%)	
Number of visits to a general practitioner in 2008					
0	489,754	(37.2%)	272,988	(35.8%)	<.001
1-2	410,260	(31.1%)	230,796	(30.3%)	
3-4	219,668	(16.7%)	130,403	(17.1%)	
5+	197,972	(15.0%)	128,543	(16.9%)	

[a]Comparison made for 2008 as it represented the mid-point of study period.
[b]P values are for the difference among the 2 groups of health plan enrollees using χ² test.
[c]As of July 1, 2008.

the preventive services applicable to both age groups (Table 3). Compared with enrollees with a chronic illness, the association of the incentive program and preventive care services among those without a chronic illness was larger for 4 of the 8 preventive services. Across these subgroups, the differences were generally quite small.

We conducted several sensitivity analyses (results in **eAppendix B**) using individual fixed effects (versus individual random effects in our main analyses), dropping year 2005 because patient co-payments in that year were different, limiting the analyses to those continuously enrolled for 7 years (to address whether selective drop out might bias results), and stratifying by prior history of hospitalizations as a marker of illness. Though the ORs vary across these analyses, across all the sensitivity analyses, entry into the incentive program is associated with increasing use of preventive care.

DISCUSSION

Across the serveral million individuals in the health plan who enrolled in the incentive program, we find that enrollment into the program was associated with increases in preventive care use across a wide range of preventive care measures. The OR for receiving a preventive service ranged from 1.34 to 3.47 across the 8 preventive services associated with incentives. We believe this is the first study that demonstrates that a health plan financial incentive programs increases use of preventive care. The results support the theory that monetary rewards might help overcome barriers to receipt of preventive care.

Among those within the incentive program, the estimated increase in receipt of prevention in a year was 3% to 9%, or a relative 19% to 97% increase. This increase in prevention is consistent with the impact of other interventions on preventive services. For example, women

■ **Table 3.** Association of Being a Member in the Financial Incentive Program and Receipt of Preventive Care Services

Preventive Care Service	All Enrollees		With No Chronic Illness[a]		With a Chronic Illness[a]		Age ≤50 years		Age >50 years	
	Number of Enrollee-Years[b]	Odds Ratio[c]	Number of Enrollee-Years[b]	Odds Ratio[c]	Number of Enrollee-Years[b]	Odds Ratio[c]	Number of Enrollee-Years[b]	Odds Ratio[c]	Number of Enrollee-Years[b]	Odds Ratio[c]
Services rewarded in program										
Cholesterol test	10,532,292	2.70	3,009,043	2.42	1,252,753	1.75	7,779,414	2.74	2,582,219	2.09
Glucose test	10,532,292	1.51	3,009,043	1.86	1,252,753	1.46	7,779,414	1.56	2,582,219	1.26
Glaucoma screening	1,271,440	1.34	1,229,583	1.61	956,565	1.65	2,275,927	1.36	2,582,219	1.30
Dental check-up	2,369,926	1.64	891,722	1.72	48,000	1.64	n/ad	n/ad		
HIV test	10,532,292	3.47	3,009,043	4.09	1,252,753	6.69	7,779,414	2.99	2,582,219	5.91
PSA test	1,401,324	1.39	292,921	1.46	335,164	1.36	n/ad	n/ad		
Papanicolaou test	5,670,824	2.17	1,603,769	2.26	682,764	2.29	4,232,238	1.84	1,351,408	1.65
Mammogram	3,282,333	1.90	846,991	1.95	566,941	1.90	1,843,747	1.94	1,351,408	1.56
Services not rewarded in program										
Colon cancer screening	2,930,750	1.30	607,264	1.44	709,184	1.57	n/ad	n/ad		
Bone density scan	493,757	1.25	74,194	1.20	159,727	1.37	n/ad	n/ad		

HIV indicates human immunodeficiency virus; PSA, prostate-specific antigen.
[a]Presence of chronic illness identified by a diagnosis code for one of 20 chronic illnesses in year prior to enrollee-year studied. Chronic illness data was only available from the health plan from 2008 through 2011. Therefore in this analysis only enrollee-years from 2009 through 2011 are included.
[b]In our analytic model, the unit of analysis is the enrollee-year. The sample is limited to those enrollees who are eligible for the preventive service based on age and gender.
[c]For all Odds Ratios in table, the associated 2-sided *P* value for the test of the hypothesis that the odds ratio equals 1 is always less than .01.
[d]We only show those preventive services that are applicable to some patients aged ≤50 and >50 years.

who faced an increased co-payment (median $20) or co-insurance of 20% were approximately 8% less likely to receive a mammogram.[4] Trials in which physicians are notified of missing preventive care among their patients increased relative delivery of preventive services by 13%.[16]

Though the incentive program substantially increased the receipt of preventive care, it is clearly not a panacea for low rates of prevention. The majority of patients did not receive all evidence-based preventive care. There are several potential reasons why the program was not associated with greater increases in use of preventive care. The financial incentive associated with a given preventive service is relatively small. For example, receiving a mammogram earns a person 1500 points and an enrollee needs 15,000 points to move from the lowest tier (Blue) to the next tier (Bronze). In contrast, Volpp and colleagues used a $750 incentive to encourage patients to quit smoking.[13] Also, the relatively complex structure of the incentives makes it difficult for the average participant to translate the receipt of points to an immediate and tangible award.[17] It is possible that a simpler program, larger incentives, or other means of making the incentive more attractive would improve the effectiveness of the program.[7] Lastly,

and perhaps most importantly, there are many barriers to receiving prevention, such as access to care and patient perceptions. The incentive program is only addressing 1 potential barrier.

It is notable that the amount the average enrollee pays to be in the incentive program (approximately $240) is close to what the average enrollee receives in incentives (approximately $275). Given this relatively weak incentive, it may be surprising that the program is associated with any increase in preventive care. It is possible that the *potential* benefits (ie, discounts on lower air fares for vacation or movie tickets) drive behavior change rather than the actual benefits received. If the incentives were larger, then it might also be more difficult for the health plan to financially sustain the program.

Our results do not support the concern that enrollees in the incentive program would concentrate their energy on just the preventive care rewarded, and thereby ignore other important care. Entry into the incentive program was associated with an *increased* likelihood of receiving preventive care services that are not included in the incentive program, though the ORs for nonincentivized preventive services were smaller than for the incentivized

Figure. Estimated Increase in Receipt of Preventive Services After Entering Incentive Program[a]
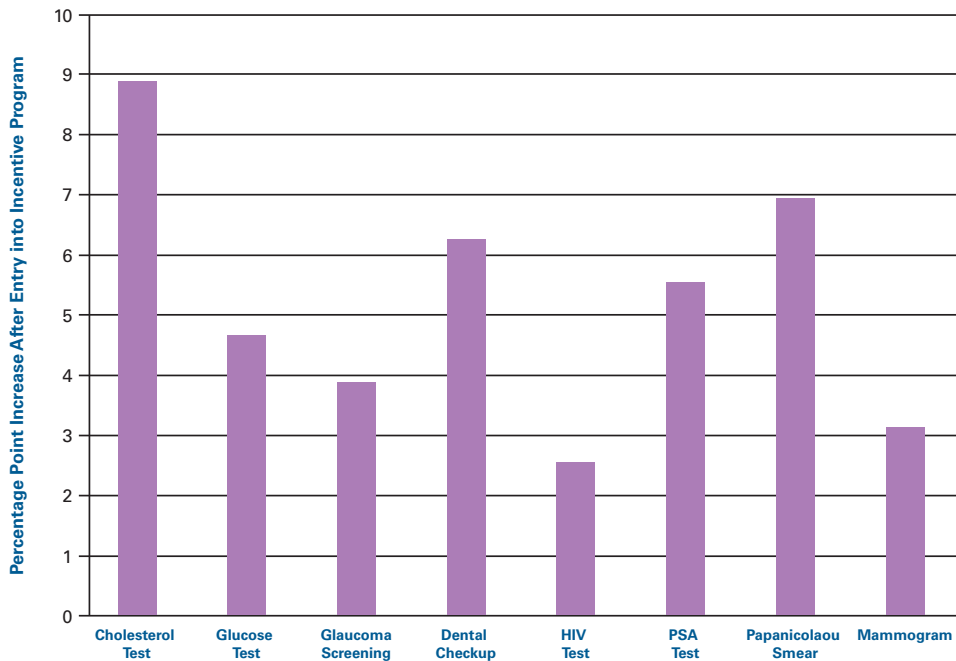
[a]From our multivariate models, we estimated the marginal effect of the incentive program on receipt of each preventive service. We present the calculated difference between the estimated marginal effect among those who entered the incentive program and those not in the incentive program.

services. This positive spillover could be due to a greater sense of wellness among those in the incentive program, which translated into more preventive care. Another possibility is that when a patient sees a physician for 1 preventive service, the physician may order other necessary care.

Among younger health plan enrollees, we see a slightly larger increase in preventive services among those enrolled in the incentive program. Older patients may have more contact with the healthcare system, which leads to more opportunities for the patient to receive the preventive care.[18] Given this baseline contact with the healthcare system, the marginal benefit of the incentive program might therefore be smaller. Also, the complex design of the program might deter older patients, and the incentives themselves (ie, flights, gym memberships) might be relatively less attractive among older patients.

The key concern with our analyses is selection bias. In our analyses, we compared each individual to themselves. We looked at the receipt of preventive care before and after the individual entered the program. This analytic design helps control for patient factors that make someone likely to enter a program. Nonetheless, given that patients were not randomized into the incentive program, we do not know whether the incentive program was itself

driving the increases in preventive care. For example, a person might decide to engage in healthier behavior and therefore join the incentive program and obtain preventive services. In such a scenario, the incentive program did not drive a response. Such selection issues might also explain why we see increase in preventive care services not associated with incentives.

There are several other important limitations of this analysis. The data we analyzed is limited to South Africa, and it is therefore unclear how it translates to other countries in other parts of the world. In eAppendix A, we compare the patient population of South Africans in the health plan and the US population. In general, the 2 groups are reasonably similar, but the rate of preventive care services at baseline among South Africans is lower than what is observed in other nations.[2] Whether the incentive program would have the same effect given a higher baseline of preventive care is unclear. Given our analytic design, we tracked yearly receipt, and many preventive care measures are only due at less regular intervals. This means the numbers we present underestimate the number of people who are up-to-date on their receipt of preventive services. Some services included in the program (ie, PSA testing) are not recommended by some organization such as the United States Preventive Services Task Force.

Lastly, it is important to highlight that enrollees had to pay to join the program, and it is therefore somewhat similar to a deposit or pre-commitment contract, which might be a more effective way to drive behavior change. It is therefore not clear whether our results would generalize to a program in which patients did not have to pay to enter.

In summary, among enrollees in a private health plan in South Africa, enrollment into a patient incentive program is associated with a higher likelihood of receiving preventive services. Patient incentive programs might be another mechanism to increase rates of preventive care.

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eAppendices.

eAppendix A represents a comparison of South African enrollees with private health insurance and the US population. In **eAppendix B** and **eAppendix C**, we present the results of sensitivity and subanalyses. Though the impact varies, we find that across all the models, entry into the incentive program is associated with an increase in receipt of preventive care. In **eAppendix D**, we list the 20 chronic illnesses that we track among the enrollees of the health plan.

e**Appendix A.** Comparison on Socioeconomic and Healthcare Status of People in South Africa With Private Insurance Versus the Entire US Population

	South Africans With Insurance From Private Sector	United States
Average income per household	$36,562	$50,221
Average number of people per household	2.60	2.50
Percent of people with bachelor's degree or higher	25.9%	27.9%
Percent of households with one or more vehicles	59.6%	91.1%
General practitioners per 1000 People	2.68	2.43
Specialist MDs per 1000 people	1.38	1.43
Nurses per 1000 people	9.56	10.75
Hospital beds per 1000 people	3.97	3.10

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eAppendix B. Sensitivity Analyses and Subanalyses

Preventive Care Service	Main results in paper		Dropping 2005^		Fixed effect model		Enrollees in health plan for all 7 years		No Hospital Services*		Hospital Services*	
	Enrollee-years	Odds Ratio	Enrollee-years	Odds Ratio	Enrollee-years	Odds Ratio	Enrollee-years	Odds Ratio	Enrollee-years	Odds Ratio	Enrollee-years	Odds Ratio
Services rewarded in program												
Cholesterol test	10,532,292	2.70	9,221,365	2.58	5,099,713	2.08	5,675,804	2.78	5,265,822	2.34	1,056,944	2.03
Glucose test	10,532,292	1.51	9,221,365	1.58	5,660,843	1.32	5,675,804	1.43	5,265,822	1.78	1,056,944	1.40
Glaucoma screening	1,271,440	1.34	4,427,895	1.41	2,948,960	1.18	3,278,995	1.33	2,492,575	1.62	589,006	1.48
Dental check-up	2,369,926	1.64	2,068,111	1.70	1,140,851	1.21	1,079,903	1.47	1,280,954	1.86	132,768	1.46
HIV test	10,532,292	3.47	9,221,365	3.58	2,489,852	2.12	5,675,804	4.63	5,265,822	4.81	1,056,944	2.43
PSA test	1,401,324	1.39	1,238,432	1.41	850,018	1.20	958,441	1.36	670,572	1.44	198,575	1.34
Papanicolaou smear	5,670,824	2.17	4,961,370	2.24	2,757,016	1.33	3,058,172	2.17	2,753,253	2.51	642,799	2.03
Mammogram	3,282,333	1.90	2,889,855	1.96	1,259,144	1.28	2,092,607	1.88	1,620,684	2.18	387,450	2.02
Services not rewarded in program												
Colon cancer screening	2,930,750	1.30	2,591,423	1.34	135,847	1.07	2,028,900	1.25	1,413,462	1.39	407,444	1.47
Bone density scan	493,757	1.25	440,269	1.26	103,919	1.20	357,125	1.35	227,474	1.29	87,899	1.27

^As noted in paper, dropped 2005 because in that year, patients had to pay a co-payment for preventive services. From 2006 through 2011, patients faced no co-payment for preventive services.

*Hospital services include both inpatient stays or any type of procedure or surgery at a hospital.

eAppendix C. Comparison of Estimated Marginal Effects of Joining the Incentive Program Using a Random-Effect Model and a Fixed-Effect Models*
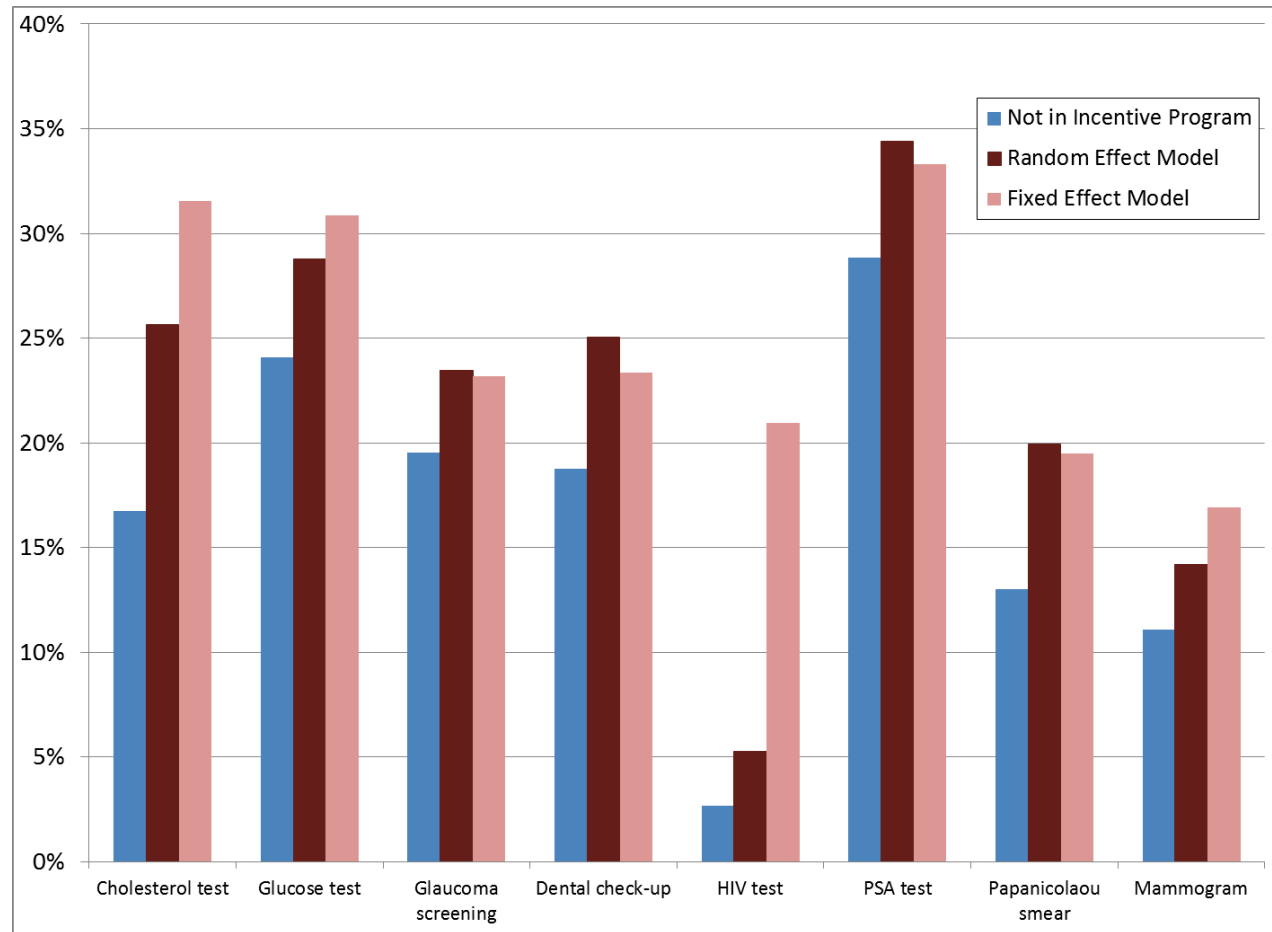
*In this figure, we compare the estimated marginal effect of joining the incentive program across 2 multivariate models that are identical except for the following: 1 uses a random effect for each enrollee and the other uses a fixed effect. Data for those in "Not in Incentive Program" and "Random Effect Model" are also shown in **Figure 2** of the main manuscript. We estimated the marginal effect in the fixed effect (ie, conditional logistic models) of joining the program making the potentially strong assumption that the average fixed effect is zero.

eAppendix D. 20 Chronic Illnesses Tracked in Our Study

Essential hypertension
Hypercholesterolemia
Asthma
Depression
Coronary artery disease
Type 2 diabetes mellitus
Hypothyroidism
Type 1 diabetes mellitus
Human immunodeficiency virus infection
Bipolar disorder – major depressive episode
Arrhythmias
Congestive heart failure
Cerebrovascular disease
Cholecystitis and cholelithiasis
Chronic renal failure
Chronic obstructive pulmonary disease
Other spinal and back disorders
Dementia: primary degenerative (Alzheimer's or Pick's Disease)
Cirrhosis of the liver
Malignant neoplasm (any type)

Source: These chronic illnesses were identified via claims data and whether a given enrollee had an episode for any of these illnesses within the 12 months prior to the enrollee year in the analysis. The health plan identified episodes of the chronic illnesses using a program called Discovery Episode Grouper (DEG). Episodes were initiated by a claim, which identified the initial occurrence of the specified condition. The following scenarios triggered the beginning of an episode: (1) diagnosis made when a patient first visits a general practitioner or specialist for treatment; (2) patient admitted to hospital and diagnosis included 1 of the listed chronic illnesses; (3) chronic medication claim relevant to the chronic illness filled.