Published in final edited form as:
Am J Prev Med. 2013 August ; 45(2): 167–174. doi:10.1016/j.amepre.2013.02.026.

Utility of the U.S. Preventive Services Task Force Criteria for Diabetes Screening

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Abstract

Background—Federal law requires certain private insurers to cover and waive patient cost sharing for preventive medical services that receive a grade of B or better from the U.S. Preventive Services Task Force (USPSTF). The USPSTF recommends that asymptomatic adults who have a blood pressure (BP) of >135/80 mmHg be screened for type 2 diabetes.

Purpose—The goals of this study were: to determine the sensitivity and specificity of the USPSTF screening criteria; and to determine the prevalence of cardiovascular risk factors and comorbidity among undiagnosed individuals by USPSTF criteria.

Methods—Data come from 7189 adults who participated in the 2003–2010 National Health and Nutrition Examination Survey; statistical analysis was conducted in 2011–2012. Participants with fasting plasma glucose ≥126 mg/dL or hemoglobin A1c (HbA1c) ≥6.5% who did not self-report a diagnosis of diabetes were categorized as having undiagnosed diabetes.

Results—Among people without diagnosed diabetes, 4.0% had undiagnosed diabetes. The proportion of adults with undiagnosed diabetes who were identified (sensitivity) using BP >135/80 mmHg as the screening standard was 44.4%; among individuals without undiagnosed diabetes, 74.8% had BP ≤135/80 mmHg (specificity). For those with undiagnosed diabetes, the prevalence of HbA1c 7.0%–<8.0% was 10.6% for those with BP ≤135/80 mmHg and 14.3% for those with BP >135/80 mmHg; and 12.8% and 9.4% for HbA1c ≥8.0%, respectively. Elevated low-density lipoprotein (100–160 mg/dL) was similar by BP cut-point (52%–53%). For those with BP ≤135/80 mmHg, 16.7% had a history of cardiovascular disease, and 22.9% had chronic kidney disease.

Conclusions—The USPSTF screening recommendations result in missing more than half of those who have undiagnosed diabetes, and a substantial proportion of these people have increased low-density lipoprotein and other cardiovascular risk factors.

Background

Diabetes is a large public health burden in the U.S. Current national estimates indicate that 25.6 million adults have diabetes, and 25%–33% of these people are undiagnosed.[1] Complications from diabetes include retinopathy, nephropathy, neuropathy, peripheral

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No financial disclosures were reported by the authors of this paper.

vascular disease, and cardiovascular disease (CVD). These complications can be prevented or delayed by improved control of blood glucose or other CVD risk factors. Thus, diabetes screening is an important public health consideration and provides the opportunity to reduce diabetes-related complications.

The U.S. Preventive Services Task Force (USPSTF or Task Force) was established in 1984 as an independent group of national experts who work to provide evidence-based recommendations about clinical preventive services, including recommendations for screening.[2] Supported by the DHHS, the Task Force consists of 16 volunteer members who come from fields of preventive medicine and primary care. From 2003 to 2008, the USPSTF recommended that asymptomatic adults with hypertension or hyperlipidemia be screened for Type 2 diabetes.[3] In 2008, the Task Force revised its guidelines and currently recommends that only asymptomatic adults with sustained blood pressure (BP) >135/80 mmHg be screened for type 2 diabetes.[4]

The USPSTF screening recommendations are in sharp contrast to the recommendations of other organizations, which base their guidelines on several criteria. The American Association of Clinical Endocrinologists[5]; the American Heart Association[6]; the American College of Physicians[7]; the Endocrine Society[8]; the Veteran's Administration[9]; and the American Diabetes Association (ADA)[10] all recommend that adults be screened for type 2 diabetes when a combination of risk factors are present. Risk factors may include age, overweight, family history, being a member of a high-risk population, a history of gestational diabetes, hypertension, polycystic ovary syndrome, presence of vascular disease, physical inactivity, and hyperlipidemia. For adults aged ≥45 years, the ADA and Veteran's Administration recommend screening every 1–3 years.[9,10] Individuals with additional risk factors may be screened at younger ages. The USPSTF does not specify the test to be used for diagnosis of type 2 diabetes, but the ADA recommends either the less expensive fasting blood glucose (FBG), or the hemoglobin A1c (HbA1c), which does not require fasting.

Increasing the proportion of people with diabetes whose condition has been diagnosed is a goal of the DHHS Healthy People 2020 program. The potential public health implications of the USPSTF recommendations for achieving this goal are augmented, since federal law requires certain insurers to cover and waive patient cost sharing for preventive medical services that receive a grade of B or better from the USPSTF. In addition, federal law sets forth a three-part standard for Medicare coverage of additional preventive services that takes into account USPSTF recommendations.

The purpose of this study is to determine the effectiveness of the USPSTF screening criteria for identifying adults with undiagnosed diabetes. The sensitivity and specificity of identifying people with undiagnosed diabetes was compared by the BP cut-point specified by the USPSTF. In addition, the magnitude of the prevalence of CVD risk factors and certain comorbidities were examined in people with undiagnosed diabetes by USPSTF screening criteria.

Methods

The National Health and Nutrition Examination Survey (NHANES) is a stratified multistage probability cluster survey conducted in the non-institutionalized U.S. population.[11] Participants are interviewed in their home for basic demographic and health information. Following the in-home interview, participants are scheduled to visit a mobile examination center (MEC) to complete physical examinations and laboratory measures.

Study Population and Definition of Diabetes

Participants were adults aged ≥20 years who completed the interview and MEC visit during the 2003–2010 NHANES cycles. Participants who answered *yes* when asked whether a physician or other healthcare professional ever told them that they had diabetes were categorized as having diagnosed diabetes. Since the purpose of the study is to identify those with undiagnosed diabetes, those with diagnosed diabetes were excluded from the analysis. People with fasting plasma glucose (FPG) ≥126 mg/dL or HbA1c ≥6.5% who did not self-report a diagnosis of diabetes were determined to have undiagnosed diabetes. Prediabetes was defined as having HbA1c 5.7%–<6.5% or FPG of 100– <126 mg/dL. People without diabetes had FPG <126 mg/dL, HbA1c <6.5%, and did not self-report diabetes.

Demographic Characteristics, Health Behaviors, and Medication Use

Participants self-reported their race, gender, and age. Smokers were identified as those who reported smoking at least 100 cigarettes in their lifetime and current cigarette use. Current BP or cholesterol medication use was self-reported by people who were told by a physician to take these medications and were currently using them. Participants reported on having a history of CVD (includes history of congestive heart failure, coronary heart disease, heart attack or angina) and history of stroke.

Clinical Measures

Blood pressure was measured using a standardized mercury sphygmomanometer after the participant rested quietly for 5 minutes. Three to four readings were taken and the readings were averaged, excluding the first measure.[12] HbA1c was standardized to the Diabetes Complications and Control Trial method. Total cholesterol, high-density lipoprotein (HDL), and triglycerides were directly measured.[13]

Low-density lipoprotein (LDL) levels were calculated for people who had fasted properly (≥8 – <24 hours) using the following formula: [LDL cholesterol] = [total cholesterol] − [HDL cholesterol] − [triglycerides/5]. HDL levels were considered high risk for CVD at HDL<40 mg/dL for men and HDL<50 mg/dL for women. BMI was determined from measured height (in meters) and weight (in kilograms) using standardized instruments. Kidney disease was defined by the presence of chronic kidney disease (Stages 1–5) using the chronic kidney disease epidemiology collaboration formula (CKD–EPI) equation and the level of the albumin-to-creatinine ratio (≥30 mg/g as a marker for CKD).[14,15]

Statistical Analysis

The prevalence of undiagnosed diabetes was determined among people without a previous diagnosis of diabetes using the USPSTF diabetes screening criteria (BP ≤135/80 mmHg vs BP >135/80 mmHg), with further stratification by demographic characteristics. Sensitivity, false negative, specificity, and false positive values were calculated using BP >135/80 mmHg as the screening cut-point for identifying undiagnosed diabetes [sensitivity=true positive/(true positive + false negative); Specificity=true negative/(true negative + false positive); see footnote of Table 1 for further detail].

Among people with undiagnosed diabetes, the prevalence of elevated CVD risk factors (HbA1c 7%–8.0%, HbA1c ≥8.0%, LDL 100–160 mg/dL, LDL>160 mg/dL, HDL<40 mg/dL for men, HDL<50 mg/dL for women, BMI ≥30, current smoking), and current medication use for hypertension and hyperlipidemia, was assessed by USPSTF diabetes screening criteria. Comparisons were tested for significance using two-sided *t*-tests ($p \leq 0.05$). All statistical analyses were conducted in 2011–2012, used sample weights, and accounted for the cluster design using SUDAAN 9.2.

Results

Prevalence of Undiagnosed Diabetes and Screening Characteristics

Among all people aged ≥20 years without diagnosed diabetes, 4.0% had undiagnosed diabetes by FPG or HbA1c criteria, including 2.2% with undiagnosed diabetes and BP ≤135/80 mmHg; and 1.8% with BP >135/80 mmHg. This BP cutoff resulted in detecting only 44.4% of those with undiagnosed diabetes (sensitivity) and missing 55.6% (% false negatives; Table 1). Further, 74.8% were correctly determined to not have undiagnosed diabetes (specificity); however, 25.2% were identified for screening when in fact they did not have undiagnosed diabetes (% false positives). The performance of using BP as a classification test was similar by age, gender, and race.

Sensitivity was similar in Mexican Americans (46.1%); non-Hispanic blacks (45.3%); and non-Hispanic whites (43.6%); it was lowest for adults aged 20–39 years (35.3%). Specificity was highest for people aged 20–39 years (87.5%) and lowest for those aged ≥65 years (55.6%). Among those without a previous diagnosis of diabetes, the prevalence of prediabetes was 41.3%, including 27.1% who had prediabetes and BP ≤135/80 mmHg, and 14.2% who had prediabetes and BP >135/80 mmHg (data not shown).

Cardiovascular Disease Risk Factor Prevalence and Undiagnosed Diabetes, According to Task Force Blood Pressure Criteria

The prevalence of CVD risk factors among people with undiagnosed diabetes was not significantly different by Task Force BP screening cut-point (Table 2). The prevalence of HbA1c 7.0%– <8.0% was 10.6% for undiagnosed individuals with BP ≤135/80 mmHg compared to 14.3% for people with BP >135/80 mmHg; however, the prevalence of HbA1c ≥8.0% was slightly higher in those with BP ≤135/80 mmHg (12.8%) compared to those with BP >135/80 mmHg (9.4%).

The prevalence of elevated LDL (100–160 mg/dL) was similar by BP cut-point; LDL >160 mg/dL was higher in those with BP >135/80 mmHg (14.8%) than in those with BP ≤135/80 mmHg (8.9%). The prevalence of high-risk HDL levels, obesity, current smoking and current use of lipid or blood pressure medications were similar in both blood pressure categories. For people with undiagnosed diabetes, the prevalence of multiple CVD risk factors was similar, irrespective of BP. Nearly all people had at least one elevated CVD risk factor, and about half had three or more elevated CVD risk factors. The prevalence of kidney disease was higher among those with BP >135/80 mmHg (32.2% vs 22.9%). The prevalence of history of CVD (13%–17%) and stroke (3%–4%) were similar by BP cut-point.

Absolute Prevalence of Cardiovascular Disease Risk Factors and Blood Pressure ≤135/80 mmHg Among People with Undiagnosed Diabetes

The magnitude of the undiagnosed population whose CVD risk management would be influenced by a failure to diagnose diabetes based on the USPSTF criteria, is determined by the combination of CVD risk factors AND a BP ≤135/80 mmHg. Among those with undiagnosed diabetes, a substantial percentage of individuals had both BP ≤135/80 mmHg and CVD risk factors (data not shown). HbA1c of 7.0%–8.0% occurred in 5.9% (SE 1.1%) and HbA1c ≥8.0% in 7.1% (1.0) of these individuals. LDL levels of 100–160 mg/dL and ≥160 mg/dL occurred in 29.9% (2.6) and 5.0% (1.2), respectively, of these individuals.

Among people with undiagnosed diabetes, the percentage with BP ≤135/80 mmHg and other CVD risk factors was 23.8% (2.1) for high-risk HDL; 15.4% (1.9) and 32.9% (2.2) for overweight (BMI 25– <30) and obesity (BMI ≥30); and 11.6% (1.5) for current smoking. Of

these individuals, 24% (1.8) currently used BP medication and 18.0% (2.1) used lipid medication. The prevalence of kidney disease and BP ≤135/80 mmHg was 12.8% (1.6).

Discussion

The Task Force recommends type 2 diabetes screening for asymptomatic adults with BP >135/80 mmHg and does not recommend screening based on age, race/ethnicity, overweight/obesity, lipid levels, or other known risk factors. However, in all demographic groups, the Task Force diabetes screening criteria did not adequately distinguish people with and without undiagnosed diabetes and missed over half of those who had undiagnosed diabetes. Other than for BP itself, the CVD risk factor profiles for people with undiagnosed diabetes were similar regardless of the USPSTF BP screening cut-point; about half of the people had three or more elevated CVD risk factors, regardless of BP. Further, a large proportion of people with undiagnosed diabetes, but with BP below the screening cut-point, have levels of glycemia and lipid levels that may warrant treatment, or intensified treatment, to prevent the complications of diabetes by current ADA treatment guidelines. Indeed, a notable proportion already had complications such as history of CVD and kidney disease.

It is noteworthy that sensitivity was especially poor among younger people who may have more to gain from glucose control than older adults with limited life expectancy. As discussed below, a finite period of good glucose control early in the course of type 2 diabetes has a “legacy effect” and can reduce microvascular and CVD in subsequent years.[16] Although younger people make up a smaller proportion of the undiagnosed, those diagnosed at younger ages will likely have a longer lifetime duration with diabetes, and therefore more to gain from glycemic control. Strategies that incorporate other diabetes risk factors may be more effective in the younger population.

Previous studies have presented alternative ways to determine who is at high risk for diabetes. National studies have developed screening scores to determine risk of diabetes by modeling several risk factors; these screeners have been utilized in the ADA diabetes questionnaires.[17–19] The most contemporary screener was developed using data from NHANES 1999–2006 and identified age, gender, family history of diabetes, history of hypertension, obesity, and physical inactivity as risk factors associated with undiagnosed diabetes.[17]

People with a screener score of 5 or more are recommended to receive formal diabetes testing in the laboratory; the sensitivity for identifying undiagnosed diabetes at this cut-point was 79%, which is notably greater than the sensitivity of the screening criteria put forth by the USPSTF (44%). Risk-score calculators are useful tools for identifying people at high risk for diabetes who should proceed to diagnostic testing. Compared to a risk-score calculator incorporating other important risk factors, screening based on BP criteria alone results in poor identification of those with undiagnosed diabetes and increases the probability of morbidity in people who are left undiagnosed and thus untreated.

Several studies provide good evidence that undiagnosed diabetes confers substantial morbidity. Selvin et al.[20] demonstrated that people with undiagnosed diabetes based on an HbA1c ≥6.5% had about twice the risk of developing CVD as those with an HbA1c of 5.0%– <5.5% (heart rate [HR]=1.95, 95% CI=1.53, 2.48); compared to those with an HbA1c of 5.0%– <5.5%, the CHD risk for those with an HbA1c of 5.5%– <6.0% was about 20% higher (HR=1.23, 95% CI=1.07, 1.41) and for those with an HbA1c of 6.0%– <6.5% was about 80% higher (HR=1.78 (95% CI=1.48, 2.15).

In another study, the probability for incident CVD was 11.4% among nondiabetic adults with an HbA1c between 5.5% and <6.5%.[21] Thus, there is evidence that people with

undiagnosed diabetes as well as those with elevated HbA1c levels even in the nondiabetic range are at increased their risk for developing CVD. Finally, national data have shown that one in four nondiabetic adults with CHD reported not being screened for diabetes in the past 3 years; substantial gains in morbidity could be made by ensuring that this subpopulation is regularly screened.[22]

The USPSTF recommendations appear to be based on the importance of controlling BP in people with type 2 diabetes. However, RCTs have shown control of other risk factors to be effective in preventing future complications. The United Kingdom Prospective Diabetes Study (UKPDS) demonstrated that tight glycemic control in people with newly diagnosed type 2 diabetes significantly reduced complications.[16] The Scandinavian Simvastatin Survival Study demonstrated that statin therapy significantly reduced major CVD events among people with diabetes.[23] Thus, achieving glycemic and other cardiovascular risk factor control is effective in preventing or delaying diabetes complications when implemented early in the course of type 2 diabetes.

No RCTs have tested whether early diabetes control as a result of screening prevents future microvascular or CVD events. However, the evidence from previous studies is consistent and suggests that diabetes control early in the course of disease prevents future complications. Indeed, observational follow-up studies from the UKPDS and Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) have demonstrated continued benefits of tight glycemic control, even after treatment-group differences in blood glucose level disappeared after conclusion of the main trials.[24,25] The “metabolic memory” or “legacy” effects evidenced from these studies highlight the long-term benefits of glycemic control.

The Diabetes Prevention Program showed that intensive lifestyle intervention or use of metformin reduced the likelihood of developing type 2 diabetes in people with prediabetes.[26] The same tests that are used for diagnosis of diabetes will detect prediabetes. Although about 25% of those with diabetes are undiagnosed, 93% of people with prediabetes are unaware of their prediabetic condition.[1,27] Thus, in addition to identifying undiagnosed diabetes, expanded screening for diabetes will identify those who may benefit from safe and effective interventions to prevent or delay type 2 diabetes.

The current study showed that 27.1% of adults had prediabetes and BP ≤135/80 mmHg; these people would not be screened for diabetes under the USPSTF criteria, and therefore would not be alerted to efforts that could prevent future diabetes. Previous work has shown that lifestyle intervention for prediabetes is highly cost effective and that use of metformin is modestly cost saving for those with prediabetes.[28] Therefore, a cost-effective healthcare intervention would be lost for people with prediabetes who have BP ≤135/80 mmHg.

Strengths and Limitations

A major strength of this study was the use of a nationally representative sample allowing generalization to the U.S. adult non-institutionalized population. A limitation of the study was the availability of only a single laboratory examination. In clinical practice, diabetes is diagnosed when at least two repeated tests confirm elevated glycemic levels. Given the cross-sectional design of NHANES, repeated measures were not available for analysis, and undiagnosed diabetes was defined as having elevated HbA1c or FPG; it is unknown how the results would be affected if repeated measures were used to define undiagnosed diabetes.

Conclusion

It should be emphasized that undiagnosed diabetes accounts for a substantial proportion of all diabetes cases.[1] Diabetes screening is essential for prompt diagnosis and initiation of individual treatment with the potential to reduce major public health burdens. Since screening for diabetes is noninvasive and can be easily and quickly performed, screening criteria should include the strongest risk factors for developing diabetes, specifically obesity, age, and family history, in order to identify as many people with undiagnosed diabetes as possible. Given the influence and importance of the USPSTF screening recommendations, due consideration should be given to other strategies and recommendations that incorporate a number of risk factors for identifying people who should be screened for type 2 diabetes.

Acknowledgments

This work was financially supported by the National Institute of Diabetes and Digestive and Kidney Diseases (HHSN267200700001G). The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute of Diabetes and Digestive and Kidney Diseases.

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Table 1

Prevalence of undiagnosed diabetes using the USPSTF recommendations for diabetes screening among adults without a previous diagnosis of diabetes

		Blood Pressure, mmHg		Screening Characteristics, % (SE)			
		≤135/80	>135/80				
	n	% (SE)	% (SE)	Sensitivity	False Negative	Specificity	False Positive
All	10,358						
Undiagnosed diabetes	741	2.2 (0.2)	1.8 (0.1)	44.4 (2.6)	55.6 (2.6)	74.8 (0.7)	25.2 (0.7)
No diabetes	9,617	71.8 (0.7)	24.2 (0.7)				
AGE (YEARS)							
20–39							
Undiagnosed diabetes	75	0.8 (0.1)	0.4 (0.1)	35.3 (7.7)	64.7 (7.7)	87.5 (0.9)	12.5 (0.9)
No diabetes	3,142	86.4 (0.9)	12.4 (0.9)				
40–64							
Undiagnosed diabetes	337	2.4 (0.3)	2.1 (0.2)	45.6 (3.7)	54.4 (3.7)	69.1 (1.2)	30.9 (1.2)
No diabetes	4,056	66.0 (1.1)	29.6 (0.2)				
≥65							
Undiagnosed diabetes	329	5.6 (0.6)	4.7 (0.6)	45.7 (4.1)	54.3 (4.1)	55.6 (1.3)	44.5 (1.3)
No diabetes	2,419	49.9 (1.3)	39.9 (1.1)				
GENDER							
Male							
Undiagnosed diabetes	419	2.9 (0.3)	2.2 (0.2)	43.7 (4.3)	56.3 (3.4)	71.7 (0.9)	28.3 (0.9)
No diabetes	4,637	68.0 (0.9)	26.9 (0.9)				
Female							
Undiagnosed diabetes	322	1.7 (0.2)	1.4 (0.2)	45.5 (4.5)	54.5 (4.5)	77.6 (0.9)	22.4 (0.9)
No diabetes	4,980	75.3 (0.9)	21.7 (0.8)				
RACE							
Non-Hispanic white							
Undiagnosed diabetes	321	2.2 (0.2)	1.7 (0.2)	43.6 (3.4)	56.4 (3.4)	74.7 (0.9)	25.3 (0.9)
No diabetes	4,845	71.9 (0.9)	24.3 (0.9)				
Non-Hispanic black							

Am J Prev Med. Author manuscript; available in PMC 2014 August 01.

		Blood Pressure, mmHg		Screening Characteristics, % (SE)			
		≤135/80	>135/80				
	n	% (SE)	% (SE)	Sensitivity	False Negative	Specificity	False Positive
Undiagnosed diabetes	156	2.6 (0.3)	2.1 (0.3)	45.3 (4.7)	54.7 (4.7)	67.6 (1.4)	32.4 (1.4)
No diabetes	1,828	64.4 (1.3)	30.9 (1.3)				
Mexican American							
Undiagnosed diabetes	175	2.7 (0.4)	2.3 (0.3)	46.1 (5.1)	53.9 (5.1)	82.0 (1.5)	18.0 (1.5)
No diabetes	1,765	77.8 (1.5)	17.1 (1.4)				

Note: FN is defined as undiagnosed diabetes with BP ≤135/80; TN as no diabetes with BP ≤135/80; TP as undiagnosed diabetes with BP >135/80; FP as no diabetes with BP >135/80. Sensitivity=TP/(TP +FN); false negative= 1−sensitivity; specificity=TN/(TN+FP); false positive= 1−specificity.

BP, blood pressure; FN, false negative; FP, false positive; NHANES, National Health and Nutrition Examination Survey, 2003–2010; TN, true negative; TP, true positive; USPSTF, U.S. Preventive Services Task Force

Table 2

Prevalence of cardiovascular disease risk factors and complications among adults with undiagnosed diabetes by USPSTF criteria for diabetes screening

	Blood Pressure, mmHg, % (SE)	
	≤ 135/80 (*n*=394)	**>135/80 (*n*=347)**
CVD RISK FACTORS		
HbA1c (%)		
<7.0	76.6 (2.89)	76.3 (2.58)
7.0–<8.0	10.6 (1.9)	14.3 (2.3)
≥8.0	12.8 (2.0)	9.4 (1.8)
LDL (mg/dL)[a]		
<100	38.1 (3.86)	32.9 (4.28)
100–160	53.0 (3.8)	52.3 (4.9)
>160	8.9 (2.2)	14.8 (3.1)
HDL, high-risk (mg/dL)[b]	42.6 (3.4)	41.4 (4.1)
BMI		
<25	13.9 (3.10)	10.4 (2.14)
25–<30	27.4 (2.9)	31.8 (2.8)
≥30	58.7 (4.1)	57.8 (3.0)
Current Smoker[d]	20.9 (2.6)	17.2 (2.9)
Current BP Medication Use[d]	42.7 (3.2)	49.2 (3.8)
Current Lipid Medication Use[d]	32.5 (3.5)	30.2 (3.0)
Multiple Risk Factors [c]		
≥1	97.7 (1.4)	99.6 (0.3)
≥2	87.1 (2.8)	86.0 (2.9)
≥3	47.7 (5.4)	47.7 (5.4)
Complications		
History of CVD[d]	16.7 (2.5)	13.2 (3.1)
History of stroke[d]	2.9 (0.8)	4.1 (1.1)
Kidney disease[e]	22.9 (2.7)	32.2 (3.6)

[a] *n*=202 for BP≤135/80 mmHg; *n*=173 for BP>135/80 mmHg

[b] High risk: men, <40 mg/dL; women, <50 mg/dL

[c] Risk factors include: HbA1c 7.0%, LDL≥100mg/dL, BMI≥25, high-risk HDL level, current smoker

[d] Self-reported

[e] Kidney disease defined by CKD–EPI equation and albumin-to-creatine ratio CKD–EPI, chronic kidney disease–epidemiology collaboration formula; CVD, cardiovascular disease; BP, blood pressure; HbA1c, hemoglobin A1c; HDL, High-density lipoprotein; LDL, low-density lipoprotein; NHANES, National Health and Nutrition Examination Survey, 2003–2010; USPSTF, U.S. Preventive Services Task Force

Table 3

Absolute prevalence of CVD risk factors and complications among adults with undiagnosed diabetes by the USPSTF criteria for diabetes screening

	Blood Pressure, mmHg, % (SE)	
	≤135/80 (*n*=394)	**>135/80 (*n*=347)**
CVD RISK FACTORS		
HbA1c (%)		
<7.0	42.6 (2.9)	33.9 (2.2)
7.0–<8.0	5.9 (1.1)	6.4 (1.2)
≥8.0	7.1 (1.0)	4.2 (0.8)
LDL (mg/dL)[a]		
<100	21.5 (2.6)	14.3 (2.1)
100–160	29.9 (2.6)	22.8 (2.9)
>160	5.0 (1.2)	6.4 (1.3)
HDL (mg/dL)[b]		
High-risk	23.8 (2.1)	18.3 (2.4)
Low-risk	32.0 (2.4)	25.9 (2.1)
BMI		
<25	7.8 (1.9)	4.6 (1.1)
25–<30	15.4 (1.9)	14.0 (1.5)
≥30	32.9 (2.2)	25.4 (1.8)
Current Smoker		
Yes	11.6 (1.5)	7.7 (1.4)
No	44.0 (2.6)	36.8 (2.4)
Current BP medication use		
Yes	23.8 (1.8)	21.9 (1.9)
No	31.9 (2.6)	22.6 (2.4)
Current Lipid medication use		
Yes	18.0 (2.1)	13.4 (1.5)
No	37.6 (2.5)	31.0 (2.4)
COMPLICATIONS		
History of CVD[d]		
Yes	9.3 (1.5)	5.9 (1.4)
No	46.3 (2.4)	38.6 (2.5)
History of stroke[d]		
Yes	1.6 (0.5)	1.8 (0.5)
No	53.9 (2.5)	42.7 (2.6)
Kidney disease[e]		
Yes	12.8 (1.6)	14.1 (1.6)

	Blood Pressure, mmHg, % (SE)	
	≤135/80 (*n*=394)	**>135/80 (*n*=347)**
No	43.3 (2.6)	29.8 (2.6)

[a] *n*=202 for BP≤135/80 mmHg; *n*=173 for BP >135/80 mmHg

[b] High risk: men, <40 mg/dL; women, <50 mg/dL

[c] Risk factors include: HbA1c ≥ 7.0%, LDL ≥ 100 mg/dL, BMI ≥ 25, high-risk HDL level, current smoker

[d] Self-reported

[e] Kidney disease defined by chronic kidney disease (CKD–EPI equation) and albumin-to-creatinine ratio

CKD–EPI, chronic kidney disease–epidemiology collaboration formula; CVD, cardiovascular disease; BP, blood pressure; HbA1c, hemoglobin A1c; HDL, High-density lipoprotein; LDL, low-density lipoprotein; NHANES, National Health and Nutrition Examination Survey, 2003–2010; USPSTF, U.S. Preventive Services Task Force