Published in final edited form as:

J Womens Health (Larchmt). 2013 April ; 22(4): 314–321. doi:10.1089/jwh.2012.4149.

Screening Low-Income Women of Reproductive Age for Cardiovascular Disease Risk Factors

Cheryl L. Robbins, PhD[1], **Thomas C. Keyserling, MD, MPH**[2], **Stephanie B. Jilcott Pitts, PhD**[3], **John Morrow, MD, MPH**[4], **Nadya Majette, MPH**[3], **Jessica A. Sisneros, MS, RD**[5], **Ashley Ronay**[3], **Sherry L. Farr, PhD**[1], **Rachel Peragallo Urrutia, MD, MSCR**[6], and **Patricia M. Dietz, DrPH**[1]

[1]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia

[2]Department of Medicine and Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

[3]Department of Public Health, East Carolina University, Greenville, North Carolina

[4]Pitt County Health Department, Greenville, North Carolina

[5]Center for Health Promotion and Disease Prevention

[6]Departments of Social Medicine and Obstetrics and Gynecology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

Abstract

Background—Identifying and treating chronic diseases, their precursors, and other cardiovascular disease (CVD) risk factors during family planning visits may improve long-term health and reproductive outcomes among low-income women. A cross-sectional study design was used to describe the prevalence of chronic diseases (hypertension, high cholesterol, and diabetes), their precursors (pre-hypertension, borderline high cholesterol, and pre-diabetes), and related CVD risk factors (such as obesity, smoking, and physical inactivity) among low-income women of reproductive age.

Methods—Prevalence of chronic diseases, their precursors, and related CVD risk factors were assessed for 462 out of 859 (53.8%) female family planning patients, ages 18–44 years, who attended a Title X clinic in eastern North Carolina during 2011 and 2012 and consented to participate. Data were obtained from clinical measurements, blood test results, and questionnaire. Differences in distribution of demographic and health care characteristics and CVD risk factors by presence of prehypertension and pre-diabetes were assessed by Pearson chi-square tests.

Address correspondence to: Cheryl L. Robbins, PhD, Centers for Disease Control and Prevention, Division of Reproductive Health, 4770 Buford Highway Northeast, Mailstop K-23, Atlanta, GA 3034, ggf9@cdc.gov.

Disclosure Statement

No competing financial interests exist.

Results—The prevalence of hypertension was 12%, high cholesterol 16%, and diabetes 3%. Nearly two-thirds of women with hypertension were newly diagnosed (62%) as were 75% of women with diabetes. The prevalence of pre-hypertension was 35%, pre-diabetes 31%, obesity 41%, smoking 32%, and physical inactivity 42%. The majority of participants (87%) had one or more chronic disease or related cardiovascular disease risk factor.

Conclusions—CVD screening during family planning visits can identify significant numbers of women at risk for poor pregnancy outcomes and future chronic disease and can provide prevention opportunities if effective interventions are available and acceptable to this population.

Introduction

Cardiovascular disease (CVD) is the leading cause of death among women overall and the third leading cause of death among women aged 18–44 years.[1,2] High blood pressure (BP), high cholesterol, and diabetes are simultaneously both CVD risk factors and chronic diseases that can manifest during women's reproductive years. For example, 10% of women ages 18–44 years have high BP and 3% have diabetes.[3] Additionally, 15% of women ages 20–45 years have high cholesterol.[4] Often, chronic diseases co-occur with other important CVD risk factors, including unhealthy weight and smoking.[5] Low-income women of reproductive age have higher rates of chronic disease and related CVD risk factors than higher income women.[6]

Identification of chronic disease precursors (e.g., pre-hypertension, borderline high cholesterol, or pre-diabetes) and related CVD risk factors may be an important opportunity to prevent future chronic disease and improve the outcomes of future pregnancies.[7,8,9] For example, individuals with pre-hypertension are at high risk of developing hypertension in the future and atherogenesis is accelerated in individuals with borderline high cholesterol.[8,9] Similarly, individuals with pre-diabetes are at increased risk of developing diabetes within 5 years.[10] Early identification of these CVD risks is also important for women's health as the majority of cardiac sudden deaths in women occur in the absence of a previous diagnosis of heart disease.[11,12] Early identification of chronic diseases (e.g., hypertension or diabetes) is also important for preconception care and for preventing adverse pregnancy outcomes such as low birth weight, preterm deliveries, and birth defects.[13] Thus, taking advantage of opportunities to identify CVD risk factors and provide needed information and interventions to women of reproductive age could improve women's health and reproductive outcomes.

CVD risk factors that can adversely affect women's health and birth outcomes can be identified during routine reproductive healthcare visits. [14] Nearly 75% of women of reproductive age visit a health care provider annually for family planning services.[14] Title X (publicly funded) family planning clinics routinely screen women for hypertension, obesity, and smoking, but not for diabetes, high cholesterol, or other CVD risk factors. Because most women who seek health care services in Title X settings have no other source of preventive care,[15] Title X clinics offer an important opportunity to detect CVD risks in low-income women before pregnancy or before development of frank disease.[16,17]

Knowledge about the prevalence of chronic diseases (hypertension, diabetes, and high cholesterol), their precursors (pre-hypertension, borderline high cholesterol, and pre-

diabetes), and related CVD risk factors (such as obesity and smoking) among low-income women of reproductive age is incomplete. This study estimates the prevalence of these conditions and characteristics associated with pre-hypertension and pre-diabetes among low-income women of reproductive age in a Title X clinic in eastern North Carolina.

Materials and Methods

The Integrated Screening and Health Assessment, Prevention, and Evaluation (InShape) Study aimed to (1) develop and evaluate a screening program for CVD risk factors, (2) facilitate and monitor referrals for identified chronic diseases and related CVD risk factors, and (3) develop and test the effectiveness of two lifestyle counseling interventions that promoted a heart healthy diet (one also promoted increased physical activity, and the other promoted weight loss). In-Shape screening was conducted in a Title X family planning clinic, in Pitt County, eastern North Carolina. Pitt County is home to a large public university and affiliated academic medical center and has an estimated population 168,148.[18] This paper reports the baseline screening results for InShape.

A cross-sectional study design was used for the InShape screening study. All women were eligible to participate in the InShape screening study if they were 18–44 years old, non-pregnant, English speaking, and attending the family planning clinic at the local health department for an initial or annual reproductive health exam between May 23, 2011 and February 28, 2012. If interested in study participation, a research assistant met with them to answer questions, obtained written informed consent, and provided a self-administered 56-item questionnaire. The questionnaire required approximately 10 minutes to complete and included questions about background and medical history. As an incentive, participants were enrolled in a lottery with a 1/150 chance of receiving a $100 gift card. The Institutional Review Board of the University of North Carolina-Chapel Hill approved this study.

Family planning clinic staff routinely assessed BP, body mass index (BMI), and smoking, and documented findings in the medical charts. To facilitate clinic efficiency, the research team collaborated with clinic staff in planning the addition of screening for high cholesterol (total cholesterol [TC] and high-density-lipoprotein [HDL-C]) and diabetes (A1c) to routine services. A referral and follow-up protocol for elevated A1c was developed for the study. Referrals and follow up for high BP, high cholesterol, and obesity were provided in accordance with existing clinic protocols. (Although lipid screening is not part of routine care for all patients in the family planning clinic, the health department offered this screening to some high-risk patients, and thus already had a protocol for referral.) Limited data were abstracted from charts of patients who declined participation: visit type, age, race/ethnicity, preferred language, BMI, tobacco use, and BP.

Measurement of chronic disease, precursors, other CVD risk factors

In accordance with the health department protocol for usual clinical care, BP was assessed with a single nurse-administered measurement using automated equipment and recorded in patients' charts. Clinic lab technicians drew blood samples for hemoglobin A1c tests and sent them to a commercial laboratory (LabCorp). Initially, TC and HDL-C were assessed using a point-of-care test, at the request of clinic staff. However, a review of blood lipid

results after 4 months of screening raised concerns that the point-of-care HDL-C levels were not valid, as many were lower than expected. Thus, parallel testing was performed (n = 44), comparing point-of-care findings to a venous sample assessed by a commercial laboratory. This comparison confirmed systematically low HDL-C values from the point-of-care testing, and thereafter blood lipids were assessed by the commercial lab and lipid results are reported for this sub-sample (n = 174). Additionally, participants responded to a self-administered questionnaire and self-reported current medication use for each chronic disease (hypertension, high cholesterol, and diabetes), tobacco use, physical activity, and family history of premature heart disease. BMI was obtained by clinical measurement and daily consumption of fruits and vegetables was obtained from chart review of self-reported clinical interview data.

Definitions

Study measures are defined in Table 1 and include chronic diseases (hypertension, diabetes, high cholesterol), chronic disease precursors (pre-hypertension, pre-diabetes, borderline high cholesterol), and other CVD risk factors (e.g., obesity, smoking, and physical inactivity). Measures of newly identified disease (yes/no) were also created for hypertension, diabetes, pre-diabetes, and high cholesterol based on self-reported history of no prior diagnosis and study measures.

Analytic plan

Descriptive statistics were used to estimate prevalence of demographic characteristics, health care access indicators, and CVD risk factors. Pearson chi-square, two-tailed tests ($p < 0.05$) were used to assess differences in these distributions by presence of pre-hypertension or pre-diabetes. Potential confounders (age and race/ethnicity) were selected based on known associations from the literature, and multivariable Poisson regression with robust variance was used to evaluate whether significant associations remained after adjustment for confounders. Due to small numbers, distributions of demographic characteristics, health care access indicators, and CVD risk factors by hypertension, borderline or high cholesterol, and diabetes were not assessed. Analyses were conducted with Stata v.11 (StataCorp, 2007).

Results

Among 859 eligible patients, 68 (7.9%) were missed and not offered study participation, 329 (38.3%) declined, and 462 (53.8%) consented to participate. Patients who declined participation tended to be leaner ($p = 0.004$) and have lower blood pressure than did enrolled women ($p < 0.0001$, data not shown), but similar in age, race/ethnicity, and preferred language.

The median age of participants was 24.5 years (mean = 26.4) with 74.9% being < 30 years of age (Table 2). Approximately three-quarters were from racial/ethnic minority groups (63.0% Black, 8.2% Hispanic). While 61.9% of participants were not college educated, more than a third (38.3%) were students (high school or college). Most were uninsured or publicly insured (97.4%) and reported that the health department was their only source of preventive care or that they had no source of preventive care (93.1%). Nearly half of the

sample (48.5%) had at least one previous live birth. Fewer than 15% indicated they had been tested for diabetes outside of pregnancy (14.7%) or that they had received a cholesterol test within the past 5 years (13.4%).

Prevalence of hypertension was 11.9%, pre-hypertension 35.1%, diabetes 2.6%, and pre-diabetes 31.0% (Table 3). Among the subsample with valid cholesterol data, 16.1% had high cholesterol. Additionally, 12.1% had borderline high cholesterol. Approximately one-third of all participants smoked (32.1%) and 87.2% of those were counseled to quit during their family planning visit. Prevalence of other CVD risk factors included obesity (40.7%), being physically inactive or insufficiently active (41.5%), and not consuming ≥ 5 fruits or vegetables daily (70.4%). Approximately 87% of women screened had one or more CVD risk factors. Nearly two-thirds of participants expressed interest in learning more about the lifestyle intervention (n = 74, 16.2%), the weight loss intervention 59 (12.9%), or both interventions (n = 156, 34.1%) offered as part of this study. The remainder of participants were unsure (n = 56, 12.2%) or not interested in either (n = 113, 24.7%). Interest in interventions did not differ by age, race/ethnicity, education, or insurance status. However, compared with participants who were unsure or not interested in either intervention, those who were interested in either/both interventions were statistically more likely to be obese (p < .001), inactive (p = .046), or to have pre-hypertension (p = .010), or pre-diabetes (p = .005).

Many chronic diseases were newly identified (Fig. 1). Among those with hypertension, 34 of 55 (61.8%) were newly identified with the condition. Among those with diabetes, 9 of 12 (75.0%) were newly identified. Additionally, 138 of 143 (96.5%) participants with pre-diabetes were newly identified (not shown). Among women with high cholesterol, 23 of 28 (82.1%) were newly identified.

Table 4 displays associations between select characteristics with pre-hypertension and pre-diabetes. More than half of the women with pre-hypertension (55.6%) or pre-diabetes (52.5%) were obese or extremely obese. A higher percentage of women with pre-hypertension reported eating fewer than five daily servings of fruits or vegetables (78.6%), compared with those without pre-hypertension (66.0%) (p = 0.006). Additionally, a higher percentage of pre-hypertensive women were physically inactive (47.8%) compared with normotensives (37.3%). However, after adjustment for age and race/ethnicity (Table 5), physical inactivity was not a statistically significant predictor of pre-hypertension. More women with pre-diabetes were non-Hispanic black (83.2%) than those with normal glucose (52.8%) (Table 4). Adjustment for age did not affect statistical significance (p < 0.001, data not shown). A higher percentage of women with pre-diabetes were smokers (75.2%) compared with those without pre-diabetes (63.8%). However, the difference was not statistically significant after adjusting for age and race (Table 5). Statistically significant differences in insurance status were not observed for either precursor.

Discussion

Among low-income women accessing family planning services at this North Carolina Title X clinic, 4 out of 5 had at least one CVD risk factor. Of particular concern was the

prevalence of pre-diabetes, pre-hypertension, smoking, and obesity; approximately 1 in 3 women had each of these conditions. Moreover, a large portion of chronic diseases and precursors were newly identified. The clinic was the only source of health care for almost all of the women in the study demonstrating the important prevention role that Title X clinics can have with uninsured, young women with CVD risk factors.

Only one published study was found that addressed chronic diseases in a Title X sample, but the researchers only reported prevalence among a select group of high-risk Title X patients. In that study, women at three Title X clinics in Baltimore, Maryland were offered screening for dyslipidemia and diabetes, based on CVD risk and age.[17] Of those who were screened for dyslipidemia (n = 110), 84% had abnormal fasting lipid profiles and of those who underwent fasting blood sugars (n = 61), 13% were abnormal. Prevalence estimates of dyslipidemia and diabetes among the present study's Title X sample were lower than those from the Baltimore study.[17] However, results from the present study were consistent with a previous study indicating high rates of chronic disease risk factors in low-income women of reproductive age.[6] Compared with other published estimates among women of reproductive age of all income levels, the present study found a higher prevalence of obesity (41% versus 17%–32%),[3,4,6,19–21] smoking (32% versus 19%–26%),[3,4,6,19,20] and pre-diabetes (31% versus 8%).[22] While no published prevalence estimates were found for pre-hypertension or borderline high cholesterol among low-income women of reproductive age, supplemental analyses of National Health and Nutrition Examination Survey data (all income levels) indicate that national prevalence of pre-hypertension among women ages 18–29 years is 12.9% (95% CI 9.5–17.4) (unpublished analyses, 2007–2008). Clinic staff used the term "di-obesi-tension" to describe the major health problems affecting their patients and anticipated that the present study would confirm high prevalence of chronic diseases and related CVD risk factors in their clinic population. Although prevalence estimates of hypertension, diabetes, and high cholesterol were similar to estimates among women of reproductive age of all income levels,[3,4,19,20,23] the sample was young (median age 24.5 years) and had very high risk for multiple chronic diseases.

What the results most importantly indicate is that many women had precursors to chronic disease and CVD, precursors that could be reversed by losing weight, increasing exercise, and stopping smoking. Lifestyle interventions can prevent or delay onset of diabetes among pre-diabetics,[7,24] but these interventions have not been tested among women of reproductive age. Many women expressed interest in the offered interventions, particularly those with multiple CVD risk factors, but expressed interest does not necessarily translate into behavior change. Behavior changes are difficult, especially for women with limited resources, free time, and competing priorities. Reproductive age women have numerous demands on their daily lives that may affect their uptake of interventions.[25] Feasibility studies are needed to improve understanding about how to make these interventions appealing to and effective for young, low-income women.

This research contributes to the small literature that focuses on these conditions among low-income women of reproductive age.[6] The high prevalence of risk factors and chronic diseases identified in this low income, largely non-white cohort suggests subsidized family planning settings are important gateways for reaching women at high risk of under-

recognized and undermanaged chronic diseases. Early identification and management of chronic diseases can impact women's health status throughout their lifespans. Reaching women of reproductive age in low-income family planning settings may also reduce the tremendous racial disparities in adverse pregnancy outcomes in the United States such as preterm birth, fetal growth restriction, fetal demise, and maternal mortality.[26] Another strength of this study is that the research design was developed in collaboration with clinic staff to minimize disruption of clinic flow and limit the number of patients requiring follow-up. Clinic staff involvement contributed to low rates of missing potential participants during recruitment, thus reducing selection bias. Point-of-care cholesterol testing was preferred by staff so that test results could be shared with patients while they were still at the clinic, eliminating the need for time-intensive follow-up. This clinic-centered approach to study design also was a limitation, as the point-of-care test results systematically underestimated HDL-C.

Due to invalid point-of-care cholesterol tests, the analyses of cholesterol status were limited by missing data on 62% of women. However, since cholesterol data is missing based only on date of visit, this likely only affects the precision of the estimate and should not bias the point estimate. Hypertension prevalence may be overestimated, as national guidelines require a diagnosis of hypertension to be based on two or more high BP measurements on two or more occasions after the patient has been sitting quietly for 5 minutes. This study assessed hypertension by a single measurement since research protocols were designed to minimize burden to staff time and disruptions to clinic flow. Additionally, white-coat hypertension could have led to inflated prevalence. Given the response rate of 54%, selection bias may have led to inflated prevalence estimates of chronic diseases, their precursors, and related risk factors as eligible women who declined enrollment tended to be leaner and normotensive. Some measures relied on self-report, which are subject to recall bias. Finally, generalizability may be limited due to the unique sample, which included a large percentage of students and a higher percentage of 18–24 year olds compared with the age distribution of Title X patients nationally. Also, this sample was limited to one Title X clinic which had fewer whites and Hispanic women compared with Title X as a whole, thus findings may not be generalizable to other Title X populations.

Conclusion

In summary, a high prevalence of pre-hypertension, pre-diabetes, obesity, and smoking was found in this sample of low-income women of reproductive age. Significant numbers of women at-risk for chronic disease and adverse pregnancy outcomes can be identified during family planning clinic visits, but research is needed to develop interventions that are appealing to this population and effective in addressing identified risk factors and chronic diseases.

Acknowledgments

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. This work was supported by Cooperative Agreement Number 5U48DP001944 from the Centers for Disease Control and Prevention. The authors gratefully acknowledge the Pitt County Health Department nurses and leadership for assisting in this study, particularly Deborah B. Herring, BSN, MHA, Stephanie Hart, RN, MA, and Susan S. Shelton, BSN. We also thank all of the women who

participated in this project. The authors also express appreciation to Hubert W. Vesper, PhD, for his expert analysis of the cholesterol test results, Larry Johnston, MA; Anne Cole, BA; and Ziya Gizlice, PhD, for their roles in assuring data quality, and Merry-K Moos for her expert review of the manuscript.

References

1. National Center for Health Statistics. [Accessed May 29, 2012] Health Data Interactive. Available at www.cdc.gov/nchs/hdi.htm
2. Heron, M.; Hoyert, D.; Murphy, S.; Xu, J.; Kochanek, K.; Tejada-Vera, B. National vital statistics reports. Vol. 57. Hyattsville, MD: National Center for Health Statistics; 2009. Deaths: Final data for 2006; p. 1-134.
3. Hayes DK, Fan AZ, Smith RA, Bombard JM. Trends in selected chronic conditions and behavioral risk factors among women of reproductive age, behavioral risk factor surveillance system, 2001–2009. Prev Chronic Dis. 2011; 8:A120. [PubMed: 22005613]
4. Kuklina EV, Yoon PW, Keenan NL. Prevalence of coronary heart disease risk factors and screening for high cholesterol levels among young adults, United States, 1999–2006. Ann Fam Med. 2010; 8:327–333. [PubMed: 20644187]
5. Egan BM, Lackland DT, Jones DW. Prehypertension: An opportunity for a new public health paradigm. Cardiol Clin. 2010; 28:561–569. [PubMed: 20937441]
6. Bombard JM, Dietz PM, Galavotti C, et al. Chronic diseases and related risk factors among low-income mothers. Mat Child Health J. 2012; 16:60–71.
7. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. New Engl J Med. 2002; 346:393–403. [PubMed: 11832527]
8. Chobanian AV, Bakris GL, et al. National Heart Lung Blood Institute. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension. 2003; 42:1206–1252. [PubMed: 14656957]
9. National Cholesterol Education Program. Third report of the expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel III). Bethesda, MD: National Heart, Lung, and Blood Institute; 2002. p. 1-284.NIH Publication No. 02-5215
10. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2013; 35:S64–S71.
11. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics—2012 update: A report from the American Heart Association. Circulation. 2012; 125:e2–e220. [PubMed: 22179539]
12. Burke AP, Farb A, Malcom GT, Liang Y, Smialek J, Virmani R. Effect of risk factors on the mechanism of acute thrombosis and sudden coronary death in women. Circulation. 1998; 97:2110–2116. [PubMed: 9626170]
13. Johnson K, Posner SF, Biermann J, et al. Recommendations to improve preconception health and health care —United States. A report of the CDC/ATSDR preconception care work group and the select panel on preconception care. MMWR Recomm Rep. 2006; 55:1–23. [PubMed: 16617292]
14. Frost JJ. Trends in U.S. women's use of sexual and reproductive health care services, 1995–2002. Am J Public Health. 2008; 98:1814–1817. [PubMed: 18703443]
15. Gold, RB.; Sonfield, A.; Richards, CL.; Frost, JJ. Next steps for America's family planning program: Leveraging the potential of Medicaid and title X in an evolving health care system. New York: AGI; 2009. p. 1-44.
16. Kent H, Streeter N. Title V Strategies to ensure a continuum of women's health services. Womens Health Issues. 2008; 18S:S67–S73. [PubMed: 19059551]
17. Cheng D, Patel P. Optimizing women's health in a Title X family planning program, Baltimore County, Maryland, 2001–2004. Prev Chronic Dis. 2011; 8:A126. [PubMed: 22005619]
18. U.S. Census Bureau. Profile of general population and housing characteristics. American FactFinder; 2010. http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml [Accessed March 14, 2013]

19. Ahluwalia IB, Mack KA, Mokdad A. Report from the CDC. Changes in selected chronic disease-related risks and health conditions for nonpregnant women 18–44 years old BRFSS. Journal of women's health (Larchmt). 2005; 14:382–386.

20. Bateman BT, Shaw KM, Kuklina EV, Callaghan WM, Seely EW, Hernandez-Diaz S. Hypertension in women of reproductive age in the United States: NHANES 1999–2008. PloS ONE. 2012:7.

21. Carroll, MD.; Kit, BK.; Lacher, DA. Total and high-density lipoprotein cholesterol in adults: National health and nutrition examination survey, 2009–2010. Hyattsville, MD: CDC/National Center for Health Statistics; 2012.

22. Cowie CC, Rust KF, Byrd-Holt DD, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. Population Diabetes Care. 2006; 29:1263–1268.

23. Gillespie CD, Keenan NL, Miner JB, Hong Y. Screening for lipid disorders among adults: National health and nutrition examination survey, United States, 2005–2008. MMWR Morb Mortal Wkly Rep. 2012; 61:26–31. [PubMed: 22695460]

24. Knowler WC, Fowler SE, et al. Diabetes Prevention Program Research Group. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. Lancet. 2009; 374:1677–1686. [PubMed: 19878986]

25. Bennett WL, Ennen CS, Carrese JA, et al. Barriers to and facilitators of postpartum follow-up care in women with recent gestational diabetes mellitus: A qualitative study. J Womens Health (Larchmt). 2011; 20:239–245. [PubMed: 21265645]

26. Bryant AS, Worjoloh A, Caughey AB, Washington AE. Racial/ethnic disparities in obstetric outcomes and care: Prevalence and determinants. Am J Obest Gynecol. 2010; 202:335–343.

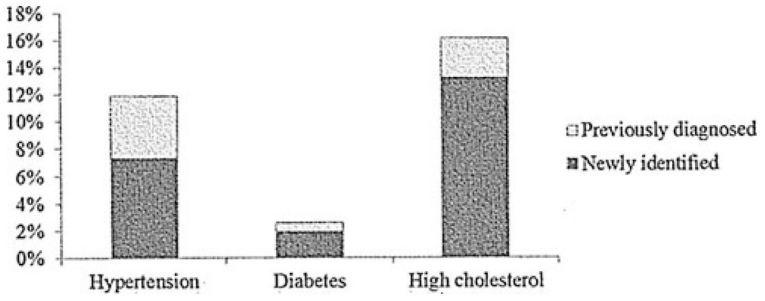

FIG. 1.

Percent of chronic diseases that were previously diagnosed and newly identified among female patients age 18–44 years screened at a family planning clinic in North Carolina 2011–2012 (n = 462).

Table 1

Characteristics of Cardiovascular Disease Risk Factors

Chronic diseases	
Hypertension	Systolic blood pressure (SBP) ≥ 140 or diastolic blood pressure (DBP) ≥ 90 mmHg and or self-reported current use of antihypertensive medication, regardless of current blood pressure measurement
Diabetes	A1c value ≥ 6.5% or self-reported current use of medication for diabetes, regardless of current A1c measurement
High cholesterol	Total cholesterol (TC) ≥ 240 mg/dL or high-density lipoprotein cholesterol <40 mg/dL, and/or self-reported current use of cholesterol-lowering medication, regardless of current cholesterol level
Chronic disease precursors	
Pre-hypertension	SBP 120–139 mm Hg or DBP 80–89 mmHg
Pre-diabetes	A1c values of 5.7%–6.4%
Borderline high cholesterol	TC = 200–239 mg/dL and not currently using cholesterol-lowering medication
Other cardiovascular disease (CVD) risk factors	
Body mass index (BMI)	Clinically measured height and weight (kg/m^2) categorized as underweight/normal (<25), overweight (25–29.9), obese (30.0–39.9), and extremely obese (≥40)
Current smoking	Self-reported current smoking categorized by average number of daily cigarettes: <1, 1–9, 10–14, and ≥15
Physical inactivity	Self-reported number of minutes per week spent on vigorous and moderate effort activities and categorized as inactive (no physical activity), insufficiently active (1–149 minutes of moderate or 1–74 minutes of vigorous activity per week, or an equivalent combination), or active (≥150 minutes/week after doubling vigorous minutes)
Family history of premature heart disease	Having a biological parent or sibling who had a heart attack or died suddenly of unexplained causes before age 55 for males, or 65 years for females
Consumption of recommended amounts of fruits and/or vegetables	Eating five or more servings of fruits or vegetables a day (self-reported)
Number of modifiable CVD risk factors	Includes hypertension, high cholesterol, diabetes, any daily tobacco use, BMI ≥ 30, physically inactive or insufficiently active, and < 5 daily servings of fruits or vegetables

Table 2

Characteristics of Female Family Planning Patients at a North Carolina Clinic, 2011–2012

Variables	*n*	%
	462	100
Demographic characteristics		
Age (years), mean (SD)	26.4 (6.3)	
18–24	249	53.9
25–29	97	21.0
30–34	61	13.2
35–44	55	11.9
Race/ethnicity		
White, non-Hispanic	126	27.3
Black, non-Hispanic	291	63.0
Hispanic	38	8.2
Other	7	1.5
Education (highest level)		
Less than 12th grade	73	15.8
12th grade, GED, or high school graduate	213	46.1
Some college	172	37.2
Student status		
No	285	61.7
Yes	177	38.3
Employment Status		
Unemployed	90	19.5
Employed or self-employed	194	42.0
Other[a]	178	38.5
Federal Poverty Level		
≤100%	383	82.9
101–199%	39	8.4
200–250%	28	6.1
> 250%	9	2.0
Number of live births		
0	237	51.3
1	119	25.8
2	68	14.7
3 +	37	8.0
Preferred Language		
English	445	96.3
Spanish	14	3.0
Health care access indicators		
Health insurance		
Uninsured	371	80.3

Variables	*n*	%
Public[b]	79	17.1
Private	12	2.6
Source of preventive care		
None	133	28.8
Health department	297	64.3
Emergency room, hospital, other clinic, or doctor's office	32	6.9
Cholesterol test within 5 years		
No	298	64.5
Yes	62	13.4
Don't know	101	21.9
Ever tested for diabetes		
No	249	53.9
Yes, only during pregnancy	88	19.1
Yes, outside of pregnancy	68	14.7
Don't know	57	12.3

Due to missing data and rounding, values may not add to 462 or 100%, respectively.

[a]Includes student, homemaker, other.

[b]Includes Medicaid, US Government plans, Champus, and Veterans Affairs.

SD, standard deviation.

Table 3

Health Indicators and Cardiovascular Disease Risk Factors Among Female Family Planning Patients at a North Carolina Clinic, 2011–2012

Health indicators	*n*	Median	Mean (SD)
Mean SBP (mm Hg)	462	117	118.0 (12.7)
Mean DBP (mm Hg)	462	74	75.0 (9.4)
Mean A1c (%)	462	5.5	5.5 (0.4)
Mean total cholesterol (mg/dL)	174	164	170.3 (36.9)
Mean HDL-C (mg/dL)	174	54	55.6 (15.6)
Mean BMI (kg/m^2)	462	28.0	29.8 (8.2)

CVD risk factors	*n*	%
Blood pressure (mm Hg)		
Normal (SBP < 120 and DBP < 80)	245	53.0
Pre-HTN (SBP 120–139 or DBP 80–89)	162	35.1
HTN (SBP ≥ 140 or DBP ≥ 90)[a]	55	11.9
Source of cholesterol test		
Point-of-care test	288	62.3
Commercial laboratory	174	37.7
A1c level		
Normal (≤5.6)	307	66.5
Pre-diabetes (5.7–6.4)	143	31.0
Diabetes (≥6.5) [b]	12	2.6
High cholesterol[c]		
Desirable[d]	125	71.8
Borderline high[e]	21	12.1
High[f]	28	16.1
Total cholesterol (mg/dL)		
< 200	142	81.6
200–239	22	12.6
≥240	10	5.8
HDL-C (mg/dL)		
≥40	156	89.7
< 40	18	10.3
Tobacco use[g]		
Nonsmoker	305	66.0
Smoker	148	32.1
(< 1 cig/day)	40	8.7
1–9 cig/day	74	16.0
10–14 cig/day	15	3.3
≥15 cig/day	19	4.1

CVD risk factors	*n*	%
BMI (kg/m^2)		
Underweight/normal (< 24.9)	149	32.3
Overweight (25–29.9)	125	27.1
Obese (30.0–39.9)	132	28.6
Extremely obese (≥40.0)	56	12.1
Physical activity[h]		
Inactive	86	18.6
Insufficiently active	106	22.9
Active	262	56.7
Daily fruit and vegetable consumption[i]		
< 5 servings	325	70.4
≥5 servings	133	28.8
Family history of premature heart disease[j]		
No	376	81.4
Yes	42	9.1
Don't know	44	9.5
Number of CVD risk factors[k]		
0	24	13.3
1	54	32.5
2	54	32.5
3	23	13.9
≥4	13	7.8

Due to missing data and rounding, values may not add to 462 or 100%, respectively.

[a] Includes women who are currently taking medication for high blood pressure.

[b] Includes women who are currently taking medication for diabetes.

[c] Based on commercial lab results (n = 174).

[d] Defined as total cholesterol (TC) < 200 and high-density-lipoprotein cholesterol (HDL-C) ≥ 40.

[e] Defined as TC 200–239 and HDL-C ≥ 40.

[f] Defined as TC ≥ 240 or HDL-C < 40, or currently taking medication for high cholesterol, regardless of current TC or HDL-C levels.

[g] Defined by self-reported average number of daily cigarettes smoked.

[h] Inactive defined as no weekly physical activity (self-reported). Insufficiently active defined as some but < 150 minutes of moderate- or < 75 minutes of vigorous-effort activity per week, or an equivalent combination. Active defined as any combination totaling ≥ 150 minutes per week.

[i] Identified through chart review of self-reported history.

[j] Self-reported family history of early heart disease in a biological relative < 65 years among mothers and sisters or < 55 years among fathers and brothers.

[k] Includes hypertension, high cholesterol, diabetes, any daily tobacco use, BMI ≥ 30 kg/m^2, physically inactive or insufficiently active, and < 5 daily servings of fruit or vegetables.

SD, standard deviation; SBP, systolic blood pressure; DBP, diastolic blood pressure; HTN, hypertension; HDL-C, high density lipoprotein cholesterol; BMI, body mass index.

Table 4

Characteristics of Chronic Disease Precursors Among Women Attending a Family Planning Clinic in Eastern North Carolina, 2011–2012

	Pre-hypertension[a]			*Pre-diabetes*[b]		
Variables	**% No (n = 239)**	**% Yes (n = 152)**	**Chi-square p-value**	**% No (n = 319)**	**% Yes (n = 143)**	**Chi-square p-value**
Demographic characteristics						
Age (years)			0.266			0.114
18–24	58.0	54.3		57.3	49.0	
25–29	22.9	18.5		22.2	20.3	
30–34	10.6	14.2		10.8	17.5	
35–44	8.6	13.0		9.8	13.3	
Race/ethnicity			0.057			< 0.001
White, non-Hispanic	28.2	29.0		36.5	8.4	
Black, non-Hispanic	58.0	65.4		52.8	83.2	
Hispanic	11.8	4.3		9.1	7.0	
Other	2.0	1.2		1.6	1.4	
Education (highest level)			0.774			0.954
Less than 12th grade	15.7	13.4		16.0	14.9	
12th grade, GED, or high school graduate	47.5	46.6		46.4	46.8	
Some college	36.8	39.8		37.6	38.3	
Uninsured			0.184			0.879
No	22.0	16.7		20.2	19.6	
Yes	78.0	83.3		79.8	80.4	
Modifiable risk factors						
Tobacco use			0.612			0.012
No	68.5	66.0		63.1	75.2	
Yes	31.5	34.0		36.9	24.8	
BMI (kg/m^2)			< 0.001			0.001
Underweight/normal (< 24.9)	45.3	20.4		38.1	22.4	
Overweight (25–29.9)	31.4	24.1		28.7	25.2	
Obese (30.0–39.9)	18.0	40.1		23.1	37.1	
Extremely obese (≥ 40.0)	5.3	15.4		10.1	15.4	

Variables	*Pre-hypertension*[a]			*Pre-diabetes*[b]		
	% No (n = 239)	**% Yes (n = 152)**	**Chi-square p-value**	**% No (n = 319)**	**% Yes (n = 143)**	**Chi-square p-value**
Physically inactive[d]			0.038			0.406
No	62.7	52.2		58.8	54.6	
Yes	37.3	47.8		41.2	45.4	
Fruits and vegetables[e]			0.006			0.070
<5 servings/day	66.0	78.6		68.2	76.6	
≥5 servings/day	34.0	21.4		31.8	23.4	

*Pearson chi-square $p < 0.05$.

[a] $n = 407$; excludes women previously diagnosed with hypertension outside of pregnancy or currently on medication for high blood pressure.

[b] $n = 450$; excludes women previously diagnosed with diabetes outside of pregnancy, or currently on medication for diabetes.

[c] Defined as any self-reported daily cigarette smoking.

[d] Defined as any combination of self-reported moderate or vigorous activity totaling <150 minutes per week.

[e] Identified through chart review of self-reported history.

Table 5

Multivariable Poisson Regression Modeling Associations of Modifiable Risk Factors with Pre-hypertension and Pre-diabetes Among Sample of Female Family Planning Patients at a North Carolina Clinic, 2011–2012

	Pre-hypertension[a]		Pre-diabetes[b]	
Variables	**aPR[c]**	**95% CI**	**aPR@[c]**	**95% CI**
Tobacco use[d]				
No	REF	N/A	REF	N/A
Yes	1.1	0.8–1.4	0.9	0.6–1.2
BMI (kg/m^2)				
Underweight/normal (< 24.9)	REF	N/A	REF	N/A
Overweight (25–29.9)	1.5	1.0–2.2	1.2	0.8–1.8
Obese (30.0–39.9)	2.6	1.9–3.7	1.6	1.1–2.3
Extremely obese (≥40.0)	2.8	1.9–4.1	1.6	1.0–2.4
Physically inactive[e]				
No	REF	N/A	REF	N/A
Yes	1.2	1.0–1.6	0.9	0.7–1.2
Fruits and vegetables[f]				
< 5 servings/day	REF	N/A	REF	N/A
≥5 servings/day	0.7	0.5–0.9	0.8	0.6–1.1

[a] n = 407; excludes women previously diagnosed with hypertension outside of pregnancy or currently on medication for high blood pressure.

[b] n = 450; excludes women previously diagnosed with diabetes outside of pregnancy, or currently on medication for diabetes.

[c] Adjusted for age and race/ethnicity.

[d] Defined as any self-reported daily cigarette smoking.

[e] Defined as any combination of self-reported moderate or vigorous activity totaling < 150 minutes per week.

[f] Identified through chart review of self-reported history.

aPR, adjusted prevalence ratio; CI, confidence interval.