

Supplemental Material

Data S1.

Supplemental Methods

Enhanced Methodology

1. Classification of HDP Outcomes - Preeclampsia and Gestational Hypertension.

To improve and refine the accuracy of the HDP outcome classification, we included additional ICD-9 codes for unspecified hypertension and selected the last diagnosis code closest to the delivery date recorded in the delivery hospitalization discharge summary. When both preeclampsia and gestational hypertension ICD-9/10 codes were found in a record, we classified the outcome as preeclampsia.

Our methodology to improve the accurate classification of gestational hypertension and to define early preeclampsia and late preeclampsia with the following modifications:

- 1) The ICD-codes closest to the delivery hospitalization were selected to classify the specific hypertensive disorder of pregnancy: preeclampsia and gestational hypertension. This process prioritized the discharge summary diagnosis codes in lieu of earlier outpatient visits that are more likely to change later in pregnancy and definitively listed at delivery hospitalization.
- 2) The inclusion of the additional ICD-9 codes, 642.90 through 642.94, for unspecified hypertension complicating pregnancy, which had been previously utilized by mapping only the ICD-10 codes.
- 3) The gestational age of the diagnosis based on the ICD codes was utilized to categorize early preeclampsia and late preeclampsia for the development and validation datasets.

2. Methods to Identify the BPT Trajectory Groups:

We first fit group-based trajectory models to identify distinct early pregnancy BP trajectory groups during the first 20 weeks' gestation using the model development dataset. This statistical approach combines finite mixture modeling and growth curve modeling into a unified model to identify latent classes of individuals with similar patterns of change over time.³¹ Specifically, we fit each trajectory curves with third order polynomial terms to allow for curvature in the patterns of longitudinal BP measurements during the first 20 weeks' gestation; we tested for statistical significance of quadratic and cubic terms to determine the appropriate shape of each trajectory pattern, with model parameters estimated by maximum likelihood, and we used the Bayes Factor to determine the number of latent groups.²⁹ [Reference: Gunderson EP, et al. Early Pregnancy Blood Pressure Patterns Identify Risk of Hypertensive Disorders of Pregnancy Among Racial and Ethnic Groups. *Hypertension*. 2022;79(3):599-613.]

3. Models and Prediction Equations

Table S4 shows the model coefficients for prediction of early-onset preeclampsia, and later-onset preeclampsia and gestational hypertension. The equations for the prediction of each HDP in the models are also shown below.

Prediction Models – Enhanced Supplemental Methods.

General Formula: For a multinomial model with M categories and reference category $m = 1$,
 $\Pr(Y = 1|X = x) = \frac{1}{1 + \sum_{j=2}^M \exp(x\beta_j)}$ and $\Pr(Y = m|X = x) = \frac{\exp(x\beta_m)}{1 + \sum_{j=2}^M \exp(x\beta_j)}$ for $m = 2, \dots, M$.

Example prediction model using multinomial model equations.

Covariates for example woman: Maternal age 25 years, Hispanic, nulliparous, no diabetes, pre-pregnancy BMI = 30 kg/m², blood pressure trajectory group 5 (Moderate-stable), neighborhood deprivation index Q1, no government health insurance, never smoker, rate of gestational weight gain up to 20 weeks gestational age = 0.5 kg per week.

Example Calculations:

$$x\beta_{earlyPE} = -9.4235 + 0.0245(25) + 0.3937 + 1.0544 + 0.0264(30) + 1.8512 + 0.3329(0.5) = -4.5533$$

$$x\beta_{latePE} = -6.7792 + 0.0232(25) + 1.2426 + 1.2426 + 0.0258(30) + 1.6362 + 0.1577(0.5) = -2.1304$$

$$x\beta_{GH} = -7.4698 + 0.0280(25) - 0.2474 + 0.9370 + 0.0391(30) + 2.5145 + 0.2973(0.5) = -2.2441$$

$$1 + \sum_{j=2}^M \exp(x\beta_j) = 1 + \exp(-4.5533) + \exp(-2.1304) + \exp(-2.2441) = 1.2354$$

$$\Pr(Y = \text{early PE}|X = x) = \frac{\exp(x\beta_{earlyPE})}{1 + \sum_{j=2}^M \exp(x\beta_j)} = \frac{\exp(-4.5533)}{1.2354} = 0.0085 = 0.85\%$$

$$\Pr(Y = \text{late PE}|X = x) = \frac{\exp(x\beta_{latePE})}{1 + \sum_{j=2}^M \exp(x\beta_j)} = \frac{\exp(-2.1304)}{1.2354} = 0.0962 = 9.62\%$$

$$\Pr(Y = \text{GH}|X = x) = \frac{\exp(x\beta_{GH})}{1 + \sum_{j=2}^M \exp(x\beta_j)} = \frac{\exp(-2.2441)}{1.2354} = 0.0858 = 8.58\%$$

Table S1. TRIPOD Checklist: Prediction Model Development

Section/Topic	Item	Checklist Item	Page
Title and abstract			
Title	1	Identify the study as developing and/or validating a multivariable prediction model, the target population, and the outcome to be predicted.	1
Abstract	2	Provide a summary of objectives, study design, setting, participants, sample size, predictors, outcome, statistical analysis, results, and conclusions.	2-3
Introduction			
Background and objectives	3a	Explain the medical context (including whether diagnostic or prognostic) and rationale for developing or validating the multivariable prediction model, including references to existing models.	6-7
	3b	Specify the objectives, including whether the study describes the development or validation of the model or both.	7
Methods			
Source of data	4a	Describe the study design or source of data (e.g., randomized trial, cohort, or registry data), separately for the development and validation data sets, if applicable.	8-9
	4b	Specify the key study dates, including start of accrual; end of accrual; and, if applicable, end of follow-up.	8
Participants	5a	Specify key elements of the study setting (e.g., primary care, secondary care, general population) including number and location of centres.	8
	5b	Describe eligibility criteria for participants.	8-9
	5c	Give details of treatments received, if relevant.	NA
Outcome	6a	Clearly define the outcome that is predicted by the prediction model, including how and when assessed.	10
	6b	Report any actions to blind assessment of the outcome to be predicted.	NA
Predictors	7a	Clearly define all predictors used in developing or validating the multivariable prediction model, including how and when they were measured.	9-11
	7b	Report any actions to blind assessment of predictors for the outcome and other predictors.	NA
Sample size	8	Explain how the study size was arrived at.	9
Missing data	9	Describe how missing data were handled (e.g., complete-case analysis, single imputation, multiple imputation) with details of any imputation method.	31
Statistical analysis methods	10a	Describe how predictors were handled in the analyses.	11-13
	10b	Specify type of model, all model-building procedures (including any predictor selection), and method for internal validation.	11-13
	10d	Specify all measures used to assess model performance and, if relevant, to compare multiple models.	12
Risk groups	11	Provide details on how risk groups were created, if done.	9-10
Results			
Participants	13a	Describe the flow of participants through the study, including the number of participants with and without the outcome and, if applicable, a summary of the follow-up time. A diagram may be helpful.	34, 28-29
	13b	Describe the characteristics of the participants (basic demographics, clinical features, available predictors), including the number of participants with missing data for predictors and outcome.	13, 34
Model development	14a	Specify the number of participants and outcome events in each analysis.	34, 30-31
	14b	If done, report the unadjusted association between each candidate predictor and outcome.	32
Model specification	15a	Present the full prediction model to allow predictions for individuals (i.e., all regression coefficients, and model intercept or baseline survival at a given time point).	32
	15b	Explain how to use the prediction model.	21
Model performance	16	Report performance measures (with CIs) for the prediction model.	32
Discussion			
Limitations	18	Discuss any limitations of the study (such as nonrepresentative sample, few events per predictor, missing data).	20-21
Interpretation	19b	Give an overall interpretation of the results, considering objectives, limitations, and results from similar studies, and other relevant evidence.	21-22
Implications	20	Discuss the potential clinical use of the model and implications for future research.	4, 21
Other information			
Supplementary information	21	Provide information about the availability of supplementary resources, such as study protocol, Web calculator, and data sets.	Supplmt file
Funding	22	Give the source of funding and the role of the funders for the present study.	22

We recommend using the TRIPOD Checklist in conjunction with the TRIPOD Explanation and Elaboration document.

Table S2. Maternal Characteristics in the Model Development Dataset (N=174,925 and the Internal Independent Validation Dataset (N=74,967) for One Singleton Live or Still Birth per Individual Among Low-to-Moderate Risk Women (2009-2019).

Characteristics	Total Sample N=249,892	Model- Development N=174,925	Model Validation N=74,967	P-value
Mean (SD) or n (%)				
Maternal age, y, mean (SD)	30.9 (5.3)	30.9 (5.3)	31.0 (5.3)	0.12
Age categories, n (%)				0.11
18-25 y	45752 (18)	32163 (18)	13589 (18)	
26-30 y	77836 (31)	54617 (31)	23219 (31)	
31-35 y	83341 (33)	58060 (33)	25281 (34)	
36-40 y	36466 (15)	25541 (15)	10925 (15)	
41-45 y	6497 (3)	4544 (3)	1953 (3)	
Racial and ethnic groups, n (%)				0.40
Asian	63410 (25)	44216 (25)	19194 (26)	
Black	18066 (7)	12708 (7)	5358 (7)	
Hispanic	66003 (26)	46289 (26)	19714 (26)	
White	91329 (37)	63927 (37)	27402 (37)	
Mixed/Native/unknown	11084 (4)	7785 (4)	3299 (4)	
Prenatal parity, n (%)				0.19
Nulliparous (0 prior births)	142872 (57)	99972 (57)	42900 (57)	
Primiparous (1 prior birth)	67194 (27)	47215 (27)	19979 (27)	
Biparous (2 prior births)	27225 (11)	18947 (11)	8278 (11)	
Multiparous (3 or more prior birth)	12601 (5)	8791 (5)	3810 (5)	
Gestational age at first prenatal care visit, (weeks), mean (SD)	8.2 (2.0)	8.2 (2.0)	8.2 (2.0)	0.28
Diabetes, Pregestational, n (%)	1558 (1)	1078 (1)	480 (1)	0.48
Prepregnancy weight, (kg), mean (SD)	68.9 (16.6)	68.9 (16.6)	68.8 (16.5)	0.06
Height, (cm), mean (SD)	162.5 (7.0)	162.5 (7.0)	162.5 (7.0)	0.26
Prepregnancy BMI, kg/m ² , mean (SD)	26.0 (5.8)	26.0 (5.8)	26.0 (5.8)	0.11
Prepregnancy BMI Categories, n (%)				0.24
Underweight (<18.5)	6761 (3)	4666 (3)	2095 (3)	
Normal weight (18.5-24.9)	123198 (50)	86172 (50)	37026 (50)	
Overweight (25-29.9)	67231 (27)	47046 (27)	20185 (27)	
Obesity class I (30-34.9)	30564 (12)	21515 (12)	9049 (12)	
Obesity class II (35-39.9)	12882 (5)	9020 (5)	3862 (5)	
Obesity class III (≥40)	7435 (3)	5248 (3)	2187 (3)	
<u>Social Factors</u>				
Government health insurance, n (%)	18401 (7)	12881 (7)	5520 (7)	1.00
Neighborhood deprivation index, n (%)				0.14
Q1 ≤-1 (least deprived)	28723 (12)	20135 (12)	8588 (11)	
Q2 >-1 and ≤0	125947 (50)	87984 (50)	37963 (51)	
Q3 >0 and ≤1	64742 (26)	45318 (26)	19424 (26)	
Q4 >1 (most deprived)	30076 (12)	21214 (12)	8862 (12)	

Table S2, Continued:

<u>Lifestyle Behaviors</u>				
Smoking status, n (%)				0.60
Current	14087 (6)	9918 (6)	4169 (6)	
Former	30409 (12)	21300 (12)	9109 (12)	
Never	204169 (82)	142836 (82)	61333 (82)	
Unknown	1227 (0)	871 (0)	356 (0)	
Total gestational weight gain, (kg), mean (SD)	13.5 (6.5)	13.5 (6.5)	13.5 (6.4)	0.18
Rate of gestational weight gain \leq 20 weeks GA, (kg per wk), mean (SD)	0.2 (0.2)	0.2 (0.2)	0.2 (0.2)	0.67
<u>Early pregnancy BP trajectory groups, n (%)</u>				
Elevated-stable	17284 (7)	12068 (7)	5216 (7)	
Moderate-stable	63550 (25)	44738 (26)	18812 (25)	
Low-increasing	48066 (19)	33579 (19)	14487 (19)	
Moderate-fast-decline	25288 (10)	17639 (10)	7649 (10)	
Low-declining	80356 (32)	56079 (32)	24277 (32)	
Ultra-low-declining	15348 (6)	10822 (6)	4526 (6)	
No. of BP measurements up to 20 weeks GA, mean (SD)	4.1 (1.7)	4.1 (1.7)	4.1 (1.7)	0.70
Delivery gestational age, (weeks), mean (SD)	39.2 (2.0)	39.2 (2.0)	39.3 (2.0)	0.90

BMI, body mass index; BP, blood pressure; GA, gestational age; SD, standard deviation.

Table S3. Predictive Model Performance for Hypertensive Disorders of Pregnancy Among Low-to-Moderate Risk Women Utilizing Six Early Pregnancy Blood Pressure Trajectory Groups, Standard Risk Factors, Lifestyle Behaviors, and Social Factors (Model 3.3) and With the Addition of Interaction Terms for Pre-pregnancy BMI, Parity, Racial and Ethnic Groups (Model 3.4), or Group Probabilities for BPT Groups (Model 3.5). C-statistics (95%CI) N=74,967 validation dataset.

Model number	Predictive Model Variables	Prediction Model C-statistics (95%CI)		
		Early-onset Preeclampsia (<34 weeks)	Late-onset Preeclampsia (≥34 weeks)	Gestational Hypertension
3.3	Six BPT groups + Standard Risk Factors (BMI + Parity + Age + Race/ethnicity + Diabetes) + Lifestyle Behaviors + Social Factors	0.747 (0.719-0.775)	0.731 (0.723-0.740)	0.770 (0.762-0.778)
3.4	Six BPT groups + Standard Risk Factors (BMI + Parity + Age + Race/ethnicity + Diabetes) + Lifestyle Behaviors + Social Factors + Interaction terms for pre-pregnancy BMI, parity, and racial/ethnic groups	0.748 (0.721-0.776)	0.731 (0.723-0.740)	0.770 (0.762-0.778)
3.5	Six BPT groups + Standard Risk Factors (BMI + Parity + Age + Race/ethnicity + Diabetes) + Lifestyle Behaviors + Social Factors + Group probabilities for BPT groups	0.755 (0.728-0.782)	0.735 (0.727-0.744)	0.777 (0.769-0.784)
<p>Abbreviations: BP, blood pressure; BMI, pre-pregnancy body mass index; BPT, blood pressure trajectory</p> <p>Standard Risk factors: Pre-pregnancy BMI (kg/m²), parity (0 vs ≥1), maternal age (years), racial and ethnic groups [Black, Hispanic, Asian, White (referent), Mixed/Native/unknown], and pregestational diabetes;</p> <p>Lifestyle Behaviors: Smoking during pregnancy, and Rate of gestational weight gain (GWG) ≤ 20 weeks' gestation (kg per week).</p> <p>Social Factors: Government health insurance and Neighborhood deprivation index</p> <p>C-statistics for Model 1: Six BPT + Standard Risk factors, Model 2: Six BPT + Standard Risk Factors + Interaction terms for pre-pregnancy BMI, parity and racial and ethnic groups, Model 3: Six BPT groups + Standard Risk Factors, Lifestyle Behaviors and Social Factors + BPT Group probabilities.</p>				

Table S4. Model coefficients for predicting risk of Early-onset Preeclampsia, Later-onset Preeclampsia, Gestational Hypertension, and No HDP Outcomes for the Model-Development (N=174,925) Dataset; Singleton Gestations, One Live or Still Birth per Individual Among Women at Low-to-Moderate Risk (2009-2019).

Covariate	Early-onset Preeclampsia	Later-onset Preeclampsia	Gestational Hypertension	No HDP (ref)
Intercept	-9.4235	-6.7792	-7.4698	0
Maternal age, years	0.0245	0.0232	0.0280	0
Race and ethnicity,				
Asian	0.4476	0.1906	-0.0710	0
Black	0.7735	0.3397	-0.1155	0
Hispanic	0.3937	0.3372	-0.2474	0
Mixed/Native/unknown	0.1360	0.1795	-0.0350	0
White (referent)	0	0	0	0
Prenatal parity				
Nulliparous	1.0544	1.2426	0.9370	0
Parous (referent)	0	0	0	0
Diabetes, pregestational	1.4863	0.9916	0.2530	0
Pre-pregnancy BMI, kg/m ²	0.0264	0.0258	0.0391	0
Blood Pressure Trajectory Group				
1 Ultra-low-declining (referent)				
2 Low-declining	0.6249	0.5791	0.9134	0
3 Moderate-fast-decline	0.8477	1.0349	1.6163	0
4 Low-increasing	1.3952	1.1222	1.7583	0
5 Moderate-stable	1.8512	1.6362	2.5145	0
6 Elevated-stable	2.5250	2.1835	3.2699	0
<i><u>Social Factors</u></i>				
Neighborhood deprivation index (NDI)				
Q1 (least deprived, referent)	0	0	0	0
Q2	0.0609	0.0292	-0.0468	0
Q3	0.0992	0.0509	-0.0780	0
Q4 (most deprived)	0.1452	0.0989	-0.0608	0
Government health insurance	-0.0165	0.1812	0.1849	0
<i><u>Lifestyle Behaviors</u></i>				
Smoking status, n (%)				
Current	-0.0280	0.0292	0.0922	0
Former	-0.1115	0.0578	0.1138	0
Never (ref)	0	0	0	0
Rate of gestational weight gain up to 20 weeks' gestation (kg per week)	0.3329	0.1577	0.2973	0

HDP, hypertensive disorders of pregnancy; BMI, body mass index; SD, standard deviation. Early-onset Preeclampsia is a diagnosis <34 weeks' gestational age; Later-onset Preeclampsia is a diagnosis ≥34 weeks' gestational age

Table S5. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Stratified by the Number of Moderate Risk Factors and Diabetes: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
No Risk Factors (N=12,390).							
Elevated-stable	380 (3.1)	17	4.7	4.5 (2.6-7.1)	36	8.1	9.5 (6.7-12.9)
Moderate-stable	2,243 (18.1)	61	2.9	2.7 (2.1-3.5)	86	3.9	3.8 (3.1-4.7)
Low-increasing	2,277 (18.4)	33	1.8	1.4 (1.0-2.0)	35	1.8	1.5 (1.1-2.1)
Moderate-fast-decline	1,217 (9.8)	20	1.6	1.6 (1.0-2.5)	12	1.6	1.0 (0.5-1.7)
Low-declining	5,176 (41.8)	43	1.0	0.8 (0.6-1.1)	44	0.8	0.9 (0.6-1.1)
Ultra-low-declining	1,097 (8.9)	9	0.6	0.8 (0.4-1.6)	4	0.3	0.4 (0.1-0.9)
Overall	12,390	183	1.6	1.5 (1.3-1.7)	217	1.8	1.8 (1.5-2.0)
One Risk Factor (N=36,684).							
Elevated-stable	2,129 (5.0)	203	10.0	9.5(8.3-10.9)	332	14.0	15.6(14.1-17.2)
Moderate-stable	8,499 (23.2)	512	6.6	6.0 (5.5-6.6)	640	7.2	7.5 (7.0-8.1)
Low-increasing	7,136 (19.5)	280	4.2	3.9 (3.5-4.4)	243	3.5	3.4 (3.0-3.9)
Moderate-fast-decline	3,822 (10.4)	119	3.8	3.1 (2.6-3.7)	119	3.0	3.1 (2.6-3.7)
Low-declining	12,663 (34.5)	285	2.5	2.3 (2.0-2.5)	204	1.5	1.6 (1.4-1.8)
Ultra-low-declining	2,435 (6.6)	32	1.4	1.3 (0.9-1.9)	15	0.6	0.6 (0.3-1.0)
Overall	36,684	1,431	4.3	3.9 (3.7-4.1)	1553	4.0	4.2 (4.0-4.4)
Two Risk Factors (N=19,029).							
Elevated-stable	1,765 (9.3)	216	12.8	12.2(10.7-13.9)	300	17.6	17.0(15.3-18.8)
Moderate-stable	5,582 (29.3)	466	8.4	8.3 (7.6-9.1)	540	9.1	9.7 (8.9-10.5)
Low-increasing	3,760 (19.8)	239	5.5	6.4 (5.6-7.2)	174	4.4	4.6 (4.0-5.3)
Moderate-fast-decline	1,964 (10.3)	113	4.8	5.8 (4.8-6.9)	92	3.8	4.7 (3.8-5.7)
Low-declining	5,118 (26.9)	207	3.2	4.0 (3.5-4.6)	95	1.9	1.9 (1.5-2.3)
Ultra-low-declining	840 (4.4%)	12	1.9	1.4 (0.7-2.5)	7	0.7	0.8 (0.3-1.7)
Overall	19,029	1,253	6.2	6.6 (6.2-6.9)	1208	6.1	6.3 (6.0-6.7)
More than Two Risk Factors (N=6,171).							
Elevated-stable	880 (14.3)	153	16.1	17.4(14.9-20.1)	166	19.5	18.9(16.3-21.6)
Moderate-stable	2,306 (37.4)	274	10.9	11.9(10.6-13.3)	238	10.3%	10.3 (9.1-11.6)
Low-increasing	1,180 (19.1)	91	7.0	7.7 (6.3-9.4)	68	5.0%	5.8 (4.5-7.2)
Moderate-fast-decline	612 (9.9)	32	6.2	5.2 (3.6-7.3)	24	4.3%	3.9 (2.5-5.8)
Low-declining	1,068 (17.3)	49	3.8	4.6 (3.4-6.0)	34	2.0%	3.2 (2.2-4.4)
Ultra-low-declining	125 (2.0)	4	2.1	3.2 (0.9-8.0)	2	0.7%	1.6 (0.2-5.7)
Overall	6,171	603	9.0	9.8 (9.0-10.5)	532	8.4%	8.6 (7.9-9.3)

Note: n = 693 women excluded from the model due to missing covariates; pre-pregnancy BMI, NDI, or rate of gestational weight gain up to 20 weeks' gestation.

Table S6. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Stratified by Racial and Ethnic Groups: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Black (N=5,307) with or without moderate risk factors							
Elevated-stable	552 (10.4)	65	13.9	11.8 (9.2-14.8)	85	15.1	15.4(12.5-18.7)
Moderate-stable	1,721 (32.4)	137	8.6	8.0 (6.7-9.3)	128	7.5	7.4 (6.2-8.8)
Low-increasing	1,129 (21.3)	64	5.3	5.7 (4.4-7.2)	46	3.5	4.1 (3.0-5.4)
Moderate-fast-decline	557 (10.5)	29	4.5	5.2 (3.5-7.4)	11	2.9	2.0 (1.0-3.5)
Low-declining	1,203 (22.7)	41	2.7	3.4 (2.5-4.6)	28	1.3	2.3 (1.6-3.3)
Ultra-low-declining	145 (2.7)	3	1.6	2.1 (0.4-5.9)	2	0.5	1.4 (0.2-4.9)
Overall	5,307	339	6.5	6.4 (5.7-7.1)	300	5.4	5.7 (5.0-6.3)
Hispanic (N=19,516) with or without moderate risk factors							
Elevated-stable	1,257 (6.4)	155	13.3	12.3(10.6-14.3)	170	13.0	13.5(11.7-15.5)
Moderate-stable	4,881 (25.0)	379	8.2	7.8 (7.0-8.6)	342	6.4	7.0 (6.3-7.8)
Low-increasing	3,898 (20.0)	191	4.8	4.9 (4.2-5.6)	109	2.9	2.8 (2.3-3.4)
Moderate-fast-decline	2,142 (11.0)	80	4.2	3.7 (3.0-4.6)	51	2.5	2.4 (1.8-3.1)
Low-declining	6,295 (32.3)	164	2.5	2.6 (2.2-3.0)	85	1.1	1.4 (1.1-1.7)
Ultra-low-declining	1,043 (5.3)	12	1.3	1.2 (0.6-2.0)	5	0.4	0.5 (0.2-1.1)
Overall	19,516	981	5.2	5.0 (4.7-5.3)	762	3.7	3.9 (3.6-4.2)
Asian (N=19,018) with or without moderate risk factors							
Elevated-stable	763 (4.0)	95	11.9	12.5(10.2-15.0)	125	15.1	16.4(13.8-19.2)
Moderate-stable	3,466 (18.2)	265	7.4	7.6 (6.8-8.6)	264	7.5	7.6 (6.8-8.6)
Low-increasing	3,245 (17.1)	160	4.6	4.9 (4.2-5.7)	96	3.6	3.0 (2.4-3.6)
Moderate-fast-decline	1,617 (8.5)	64	4.0	4.0 (3.1-5.0)	54	3.1	3.3 (2.5-4.3)
Low-declining	7,769 (40.9)	182	2.5	2.3 (2.0-2.7)	97	1.5	1.2 (1.0-1.5)
Ultra-low-declining	2,158 (11.3)	31	1.3	1.4 (1.0-2.0)	14	0.6	0.6 (0.4-1.1)
Overall	19,018	797	4.1	4.2 (3.9-4.5)	650	3.5	3.4 (3.2-3.7)
White (N=27,167) with or without moderate risk factors							
Elevated-stable	2,370 (8.7)	251	10.1	10.6 (9.4-11.9)	418	17.5	17.6(16.1-19.2)
Moderate-stable	7,728 (28.4)	478	6.3	6.2 (5.7-6.7)	692	8.8	9.0 (8.3-9.6)
Low-increasing	5,438 (20.0)	201	3.8	3.7 (3.2-4.2)	238	4.1	4.4 (3.8-5.0)
Moderate-fast-decline	2,962 (10.9)	102	3.4	3.4 (2.8-4.2)	118	3.6	4.0 (3.3-4.8)
Low-declining	7,729 (28.4)	179	2.1	2.3 (2.0-2.7)	145	1.7	1.9 (1.6-2.2)
Ultra-low-declining	940 (3.5)	9	1.1	1.0 (0.4-1.8)	6	0.6	0.6 (0.2-1.4)
Overall	27,167	1,220	4.4	4.5 (4.2-4.7)	1617	5.7	6.0 (5.7-6.2)

Table S7. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Stratified by Parity: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertensio n n	Average Predicted %	Observed % (95% CI)
All Parous (N=31,691)							
Elevated-stable	1,790 (5.6)	133	6.4	7.4 (6.3-8.7)	223	10.5	12.5(11.0-14.1)
Moderate-stable	7,223 (22.8)	266	3.7	3.7 (3.3-4.1)	350	4.8	4.8 (4.4-5.4)
Low-increasing	6,050 (19.1)	113	2.2	1.9 (1.5-2.2)	125	2.2	2.1 (1.7-2.5)
Moderate-fast-decline	3,233 (10.2)	62	1.9	1.9 (1.5-2.5)	52	1.9	1.6 (1.2-2.1)
Low-declining	11,195 (35.3)	119	1.2	1.1 (0.9-1.3)	110	0.9	1.0 (0.8-1.2)
Ultra-low-declining	2,200 (6.9)	15	0.6	0.7 (0.4-1.1)	7	0.3	0.3 (0.1-0.7)
Overall	31,691	708	2.3	2.2 (2.1-2.4)	867	2.6	2.7 (2.6-2.9)
Parous with No Risk Factors (N=12,390); All Low Risk							
Elevated-stable	380 (3.1)	17	4.7	4.5 (2.6-7.1)	36	8.1	9.5 (6.7-12.9)
Moderate-stable	2,243 (18.1)	61	2.9	2.7 (2.1-3.5)	86	3.9	3.8 (3.1-4.7)
Low-increasing	2,277 (18.4)	33	1.8	1.4 (1.0-2.0)	35	1.8	1.5 (1.1-2.1)
Moderate-fast-decline	1,217 (9.8)	20	1.6	1.6 (1.0-2.5)	12	1.6	1.0 (0.5-1.7)
Low-declining	5,176 (41.8)	43	1.0	0.8 (0.6-1.1)	44	0.8	0.9 (0.6-1.1)
Ultra-low-declining	1,097 (8.9)	9	0.6	0.8 (0.4-1.6)	4	0.3	0.4 (0.1-0.9)
Overall	12,390	183	1.6	1.5 (1.3-1.7)	217	1.8	1.8 (1.5-2.0)
All Nulliparas (N=42,583)							
Elevated-stable	3,364 (7.9)	456	14.4	13.6(12.4-14.8)	611	18.5	18.2(16.9-19.5)
Moderate-stable	11,407 (26.8)	1,047	9.5	9.2 (8.7-9.7)	1154	9.6	10.1 (9.6-10.7)
Low-increasing	8,303 (19.5)	530	6.0	6.4 (5.9-6.9)	395	4.7	4.8 (4.3-5.2)
Moderate-fast-decline	4,382 (10.3)	222	5.3	5.1 (4.4-5.8)	195	4.0	4.5 (3.9-5.1)
Low-declining	12,830 (30.1)	465	3.4	3.6 (3.3-4.0)	267	1.9	2.1 (1.8-2.3)
Ultra-low-declining	2,297 (5.4)	42	1.9	1.8 (1.3-2.5)	21	0.7	0.9 (0.6-1.4)
Overall	42,583	2,762	6.5	6.5 (6.3-6.7)	2643	6.0	6.2 (6.0-6.4)
Nulliparas with No Risk factors (N=23,803)							
Elevated-stable	1,368 (5.7)	143	12.3	10.5 (8.9-12.2)	236	16.1	17.3(15.3-19.4)
Moderate-stable	5,593 (23.5)	409	8.2	7.3 (6.6-8.0)	490	8.5	8.8 (8.0-9.5)
Low-increasing	4,638 (19.5)	239	5.3	5.2 (4.5-5.8)	184	4.2	4.0 (3.4-4.6)
Moderate-fast-decline	2,490 (10.5)	101	4.7	4.1 (3.3-4.9)	99	3.6	4.0 (3.2-4.8)
Low-declining	8,180 (34.4)	238	3.2	2.9 (2.6-3.3)	155	1.8	1.9 (1.6-2.2)
Ultra-low-declining	1,534 (6.4)	28	1.8	1.8 (1.2-2.6)	14	0.7	0.9 (0.5-1.5)
Overall	23,803	1,158	5.4	4.9 (4.6-5.1)	1178	4.8	4.9 (4.7-5.2)

Table S8. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Among Nulliparas with No Risk Factors Stratified by All Racial and Ethnic Groups: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Black Nulliparas (N=1,190) No risk factors							
Elevated-stable	85 (7.1)	7	15.6	8.2 (3.4-16.2)	13	14.6	15.3 (8.4-24.7)
Moderate-stable	328 (27.6)	28	10.2	8.5 (5.7-12.1)	30	7.8	9.1 (6.3-12.8)
Low-increasing	272 (22.9)	21	6.4	7.7 (4.8-11.6)	16	3.8	5.9 (3.4-9.4)
Moderate-fast-decline	123 (10.3)	12	5.6	9.8 (5.1-16.4)	3	3.2	2.4 (0.5-7.0)
Low-declining	334 (28.1)	16	3.7	4.8 (2.8-7.7)	9	1.6	2.7 (1.2-5.1)
Ultra-low-declining	48 (4.0)	1	2.1	2.1 (0.1-11.1)	1	0.7	2.1 (0.1-11.1)
Overall	1,190	85	7.1	7.1 (5.7-8.8)	72	4.9	6.1 (4.8-7.6)
Hispanic Nulliparas (N=4,565) No risk factors							
Elevated-stable	222 (4.9)	36	15.2	16.2(11.6-21.7)	25	12.9	11.3 (7.4-16.2)
Moderate-stable	1,076 (23.6)	79	9.9	7.3 (5.9-9.1)	88	6.8	8.2 (6.6-10.0)
Low-increasing	921 (20.2)	63	6.3	6.8 (5.3-8.7)	35	3.4	3.8 (2.7-5.2)
Moderate-fast-decline	534 (11.7)	26	5.7	4.9 (3.2-7.1)	16	2.9	3.0 (1.7-4.8)
Low-declining	1,562 (34.2)	61	3.7	3.9 (3.0-5.0)	22	1.5	1.4 (0.9-2.1)
Ultra-low-declining	250 (5.5)	4	2.1	1.6 (0.4-4.0)	2	0.6	0.8 (0.1-2.9)
Overall	4,565	269	6.4	5.9 (5.2-6.6)	188	3.8	4.1 (3.6-4.7)
Asian Nulliparas (N=7,682) No risk factors							
Elevated-stable	267 (3.5)	28	13.6	10.5 (7.1-14.8)	36	15.8	13.5 (9.6-18.2)
Moderate-stable	1,317 (17.1)	121	8.9	9.2 (7.7-10.9)	100	8.4	7.6 (6.2-9.2)
Low-increasing	1,367 (17.8)	78	5.7	5.7 (4.5-7.1)	40	4.2	2.9 (2.1-4.0)
Moderate-fast-decline	645 (8.4)	29	5.0	4.5 (3.0-6.4)	25	3.6	3.9 (2.5-5.7)
Low-declining	3,222 (41.9)	94	3.3	2.9 (2.4-3.6)	55	1.8	1.7 (1.3-2.2)
Ultra-low-declining	864 (11.2)	17	1.8	2.0 (1.2-3.1)	9	0.7	1.0 (0.5-2.0)
Overall	7,682	367	5.0	4.8 (4.3-5.3)	265	3.9	3.4 (3.1-3.9)
White Nulliparas (N=10,458) No risk factors							
Elevated-stable	822 (7.9)	74	11.0	9.0 (7.1-11.2)	163	17.1	19.8(17.2-22.7)
Moderate-stable	2,958 (28.3)	194	7.2	6.6 (5.7-7.5)	283	9.1	9.6 (8.5-10.7)
Low-increasing	2,124 (20.3)	87	4.7	4.1 (3.3-5.0)	94	4.6	4.4 (3.6-5.4)
Moderate-fast-decline	1,203 (11.5)	42	4.1	3.5 (2.5-4.7)	53	3.9	4.4 (3.3-5.7)
Low-declining	3,012 (28.8)	79	2.7	2.6 (2.1-3.3)	71	2.0	2.4 (1.8-3.0)
Ultra-low-declining	339 (3.2)	6	1.5	1.8 (0.7-3.8)	3	0.8	0.9 (0.2-2.6)
Overall	10,458	482	5.2	4.6 (4.2-5.0)	667	5.9	6.4 (5.9-6.9)

Table S9. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors for Combinations of Any Two Moderate Risk Factors: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Nulliparity and Age ≥35 y (N=5,382)							
Elevated-stable	300 (5.6)	42	14.1	14.0(10.3-18.4)	56	19.7	18.7(14.4-23.5)
Moderate-stable	1,152 (21.4)	99	9.5	8.6 (7.0-10.4)	132	10.7	11.5 (9.7-13.4)
Low-increasing	1,052 (19.5)	85	6.3	8.1 (6.5-9.9)	60	5.4	5.7 (4.4-7.3)
Moderate-fast-decline	565 (10.5)	38	5.5	6.7 (4.8-9.1)	35	4.7	6.2 (4.4-8.5)
Low-declining	1,901 (35.3)	98	3.7	5.2 (4.2-6.2)	44	2.3	2.3 (1.7-3.1)
Ultra-low-declining	412 (7.7)	9	2.1	2.2 (1.0-4.1)	3	0.9	0.7 (0.2-2.1)
Overall	5,382	371	6.1	6.9 (6.2-7.6)	330	5.8	6.1 (5.5-6.8)
Nulliparity and Black (N=1,190)							
Elevated-stable	85 (7.1)	7	15.6	8.2 (3.4-16.2)	13	14.6	15.3 (8.4-24.7)
Moderate-stable	328 (27.6)	28	10.2	8.5 (5.7-12.1)	30	7.8	9.1 (6.3-12.8)
Low-increasing	272 (22.9)	21	6.4	7.7 (4.8-11.6)	16	3.8	5.9 (3.4-9.4)
Moderate-fast-decline	123 (10.3)	12	5.6	9.8 (5.1-16.4)	3	3.2	2.4 (0.5-7.0)
Low-declining	334 (28.1)	16	3.7	4.8 (2.8-7.7)	9	1.6	2.7 (1.2-5.1)
Ultra-low-declining	48 (4.0)	1	2.1	2.1 (0.1-11.1)	1	0.7	2.1 (0.1-11.1)
Overall	1,190	85	7.1	7.1 (5.7-8.8)	72	4.9	6.1 (4.8-7.6)
Nulliparity and Government Health Insurance (N=1,049)							
Elevated-stable	52 (5.0)	8	13.6	15.4 (6.9-28.1)	5	16.3	9.6 (3.2-21.0)
Moderate-stable	209 (19.9)	23	9.1	11.0 (7.1-16.1)	25	8.8	12.0 (7.9-17.1)
Low-increasing	220 (21.0)	12	6.0	5.5 (2.8-9.3)	10	4.5	4.5 (2.2-8.2)
Moderate-fast-decline	123 (11.7)	5	5.3	4.1 (1.3-9.2)	5	3.8	4.1 (1.3-9.2)
Low-declining	382 (36.4)	21	3.6	5.5 (3.4-8.3)	6	1.9	1.6 (0.6-3.4)
Ultra-low-declining	63 (6.0)	0	2.0	0.0 (0.0-5.7)	1	0.8	1.6 (0.0-8.5)
Overall	1,049	69	5.8	6.6 (5.2-8.3)	52	4.7	5.0 (3.7-6.5)
Nulliparity and Obesity (N=4,277)							
Elevated-stable	777 (18.2)	103	14.8	13.3(11.0-15.8)	161	20.8	20.7(17.9-23.7)
Moderate-stable	1,820 (42.6)	197	10.3	10.8 (9.4-12.3)	228	11.5	12.5(11.0-14.1)
Low-increasing	825 (19.3)	68	6.9	8.2 (6.5-10.3)	51	5.8	6.2 (4.6-8.0)
Moderate-fast-decline	375 (8.8)	32	6.1	8.5 (5.9-11.8)	24	5.1	6.4 (4.1-9.4)
Low-declining	456 (10.7)	27	4.1	5.9 (3.9-8.5)	12	2.6	2.6 (1.4-4.6)
Ultra-low-declining	24 (0.6)	0	2.2	0.0 (0.0-14.2)	0	1.0	0.0 (0.0-14.2)
Overall	4,277	427	9.4	10.0 (9.1-10.9)	476	10.5	11.1(10.2-12.1)

Table S9, Continued:

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Obesity and Black (N=351)							
Elevated-stable	47 (13.4)	6	7.7	12.8 (4.8-25.7)	4	11.3	8.5 (2.4-20.4)
Moderate-stable	158 (45.0)	11	4.7	7.0 (3.5-12.1)	6	5.6	3.8 (1.4-8.1)
Low-increasing	70 (19.9)	2	2.8	2.9 (0.3-9.9)	0	2.5	0.0 (0.0-5.1)
Moderate-fast-decline	29 (8.3)	0	2.4	0.0 (0.0-11.9)	1	2.1	3.4 (0.1-17.8)
Low-declining	43 (12.3)	1	1.6	2.3 (0.1-12.3)	1	1.0	2.3 (0.1-12.3)
Ultra-low-declining	4 (1.1)	0	0.9	0.0 (0.0-60.2)	0	0.4	0.0 (0.0-60.2)
Overall	351	20	4.1	5.7 (3.5-8.7)	12	4.9	3.4 (1.8-5.9)
Obesity and Government Health Insurance (N=465)							
Elevated-stable	49 (10.5)	2	7.5	4.1 (0.5-14.0)	4	13.0	8.2 (2.3-19.6)
Moderate-stable	186 (40.0)	4	4.3	2.2 (0.6-5.4)	9	6.2	4.8 (2.2-9.0)
Low-increasing	85 (18.3)	1	2.8	1.2 (0.0-6.4)	1	2.9	1.2 (0.0-6.4)
Moderate-fast-decline	50 (10.8)	3	2.4	6.0 (1.3-16.5)	2	2.4	4.0 (0.5-13.7)
Low-declining	91 (19.6)	3	1.6	3.3 (0.7-9.3)	0	1.2	0.0 (0.0-4.0)
Ultra-low-declining	4 (0.9)	0	0.8	0.0 (0.0-60.2)	0	0.5	0.0 (0.0-60.2)
Overall	465	13	3.6	2.8 (1.5-4.7)	16	4.9	3.4 (2.0-5.5)
Obesity and Age ≥35 y (N=1,462)							
Elevated-stable	176 (12.0)	16	7.0	9.1 (5.3-14.3)	24	13.7	13.6 (8.9-19.6)
Moderate-stable	537 (36.7)	25	4.4	4.7 (3.0-6.8)	42	6.7	7.8 (5.7-10.4)
Low-increasing	311 (21.3)	10	2.8	3.2 (1.6-5.8)	11	3.1	3.5 (1.8-6.2)
Moderate-fast-decline	165 (11.3)	4	2.5	2.4 (0.7-6.1)	4	2.7	2.4 (0.7-6.1)
Low-declining	254 (17.4)	4	1.6	1.6 (0.4-4.0)	7	1.3	2.8 (1.1-5.6)
Ultra-low-declining	19 (1.3)	0	0.9	0.0 (0.0-17.6)	1	0.5	5.3 (0.1-26.0)
Overall	1,462	59	3.6	4.0 (3.1-5.2)	89	5.3	6.1 (4.9-7.4)

Table S10. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Among Women with Obesity and No Risk Factors Stratified by Racial and Ethnic Groups: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Black Race and Obesity (N=351)							
Elevated-stable	47 (13.4)	6	7.7	12.8 (4.8-25.7)	4	11.3	8.5 (2.4-20.4)
Moderate-stable	158 (45.0)	11	4.7	7.0 (3.5-12.1)	6	5.6	3.8 (1.4-8.1)
Low-increasing	70 (19.9)	2	2.8	2.9 (0.3-9.9)	0	2.5	0.0 (0.0-5.1)
Moderate-fast-decline	29 (8.3)	0	2.4	0.0 (0.0-11.9)	1	2.1	3.4 (0.1-17.8)
Low-declining	43 (12.3)	1	1.6	2.3 (0.1-12.3)	1	1.0	2.3 (0.1-12.3)
Ultra-low-declining	4 (1.1)	0	0.9	0.0 (0.0-60.2)	0	0.4	0.0 (0.0-60.2)
Overall	351	20	4.1	5.7 (3.5-8.7)	12	4.9	3.4 (1.8-5.9)
Hispanic and Obesity (N=1,547)							
Elevated-stable	161 (10.4)	13	7.2	8.1 (4.4-13.4)	13	9.5	8.1 (4.4-13.4)
Moderate-stable	499 (32.3)	28	4.4	5.6 (3.8-8.0)	15	4.6	3.0 (1.7-4.9)
Low-increasing	366 (23.7)	8	2.7	2.2 (0.9-4.3)	6	2.2	1.6 (0.6-3.5)
Moderate-fast-decline	167 (10.8)	3	2.4	1.8 (0.4-5.2)	2	1.9	1.2 (0.1-4.3)
Low-declining	342 (22.1)	2	1.5	0.6 (0.1-2.1)	5	0.9	1.5 (0.5-3.4)
Ultra-low-declining	12 (0.8)	0	0.8	0.0 (0.0-26.5)	0	0.3	0.0 (0.0-26.5)
Overall	1,547	54	3.4	3.5 (2.6-4.5)	41	3.4	2.7 (1.9-3.6)
Asian and Obesity (N=393)							
Elevated-stable	46 (11.7)	4	6.0	8.7 (2.4-20.8)	3	10.3	6.5 (1.4-17.9)
Moderate-stable	123 (31.3)	2	3.8	1.6 (0.2-5.8)	7	5.4	5.7 (2.3-11.4)
Low-increasing	88 (22.4)	1	2.3	1.1 (0.0-6.2)	0	2.6	0.0 (0.0-4.1)
Moderate-fast-decline	47 (12.0)	0	2.1	0.0 (0.0-7.5)	0	2.2	0.0 (0.0-7.5)
Low-declining	79 (20.1)	0	1.3	0.0 (0.0-4.6)	0	1.1	0.0 (0.0-4.6)
Ultra-low-declining	10 (2.5)	0	0.8	0.0 (0.0-30.8)	0	0.5	0.0 (0.0-30.8)
Overall	393	7	2.9	1.8 (0.7-3.6)	10	4.0	2.5 (1.2-4.6)
White Race and Obesity (N=1,186)							
Elevated-stable	197 (16.6)	16	5.2	8.1 (4.7-12.9)	35	12.5	17.8(12.7-23.8)
Moderate-stable	444 (37.4)	13	3.1	2.9 (1.6-5.0)	27	6.0	6.1 (4.0-8.7)
Low-increasing	233 (19.6)	3	1.9	1.3 (0.3-3.7)	8	2.9	3.4 (1.5-6.7)
Moderate-fast-decline	120 (10.1)	2	1.7	1.7 (0.2-5.9)	2	2.5	1.7 (0.2-5.9)
Low-declining	183 (15.4)	1	1.1	0.5 (0.0-3.0)	2	1.2	1.1 (0.1-3.9)
Ultra-low-declining	9 (0.8)	0	0.6	0.0 (0.0-33.6)	0	0.5	0.0 (0.0-33.6)
Overall	1,186	35	2.8	3.0 (2.1-4.1)	74	5.3	6.2 (4.9-7.8)

Table S11. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Among Nulliparas (with or without risk factors) Stratified by Pre-pregnancy BMI Groups: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
All Nulliparas with Normal Weight (N=23,042)							
Elevated-stable	947 (4.1)	107	12.4	11.3 (9.4-13.5)	151	15.5	15.9(13.7-18.4)
Moderate-stable	4,546 (19.7)	317	8.3	7.0 (6.2-7.8)	382	8.3	8.4 (7.6-9.2)
Low-increasing	4,382 (19.0)	247	5.4	5.6 (5.0-6.4)	180	4.2	4.1 (3.5-4.7)
Moderate-fast-decline	2,459 (10.7)	106	4.9	4.3 (3.5-5.2)	101	3.7	4.1 (3.4-5.0)
Low-declining	8,947 (38.8)	306	3.3	3.4 (3.1-3.8)	161	1.8	1.8 (1.5-2.1)
Ultra-low-declining	1,761 (7.6)	30	1.9	1.7 (1.2-2.4)	15	0.7	0.9 (0.5-1.4)
Overall	23,042	1,113	5.1	4.8 (4.6-5.1)	990	4.2	4.3 (4.0-4.6)
All Nulliparas with Overweight (N=10,741)							
Elevated-stable	1,035 (9.6)	124	13.8	12.0(10.1-14.1)	181	17.6	17.5(15.2-19.9)
Moderate-stable	3,543 (33.0)	341	9.5	9.6 (8.7-10.6)	364	9.4	10.3 (9.3-11.3)
Low-increasing	2,336 (21.7)	144	6.2	6.2 (5.2-7.2)	114	4.8	4.9 (4.0-5.8)
Moderate-fast-decline	1,146 (10.7)	65	5.6	5.7 (4.4-7.2)	42	4.2	3.7 (2.7-4.9)
Low-declining	2,454 (22.8)	93	3.8	3.8 (3.1-4.6)	61	2.1	2.5 (1.9-3.2)
Ultra-low-declining	227 (2.1)	4	2.2	1.8 (0.5-4.5)	4	0.9	1.8 (0.5-4.5)
Overall	10,741	771	7.3	7.2 (6.7-7.7)	766	6.8	7.1 (6.7-7.6)
All Nulliparas with Obesity (N=7,376)							
Elevated-stable	1,355 (18.4)	224	16.3	16.5(14.6-18.6)	273	21.4	20.1(18.0-22.4)
Moderate-stable	3,158 (42.8)	380	11.3	12.0(10.9-13.2)	396	11.8	12.5(11.4-13.7)
Low-increasing	1,396 (18.9)	123	7.6	8.8 (7.4-10.4)	98	6.0	7.0 (5.7-8.5)
Moderate-fast-decline	644 (8.7)	47	6.8	7.3 (5.4-9.6)	43	5.2	6.7 (4.9-8.9)
Low-declining	784 (10.6)	46	4.4	5.9 (4.3-7.7)	30	2.7	3.8 (2.6-5.4)
Ultra-low-declining	39 (0.5)	0	2.4	0.0 (0.0-9.0)	1	1.1	2.6 (0.1-13.5)
Overall	7,376	820	10.3	11.1(10.4-11.9)	841	10.9	11.4(10.7-12.1)

Table S12. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Among Pre-pregnancy Body Mass Index Categories: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
All Underweight (N=2,092)							
Elevated-stable	30 (0.1)	1	10.2	3.3 (0.1-17.2)	6	12.1	20.0 (7.7-38.6)
Moderate-stable	221 (0.8)	10	5.9	4.5 (2.2-8.2)	16	5.9	7.2 (4.2-11.5)
Low-increasing	265 (1.0)	18	3.8	6.8 (4.1-10.5)	6	2.8	2.3 (0.8-4.9)
Moderate-fast-decline	182 (0.7)	5	3.5	2.7 (0.9-6.3)	9	2.5	4.9 (2.3-9.2)
Low-declining	964 (3.6)	21	2.3	2.2 (1.4-3.3)	18	1.2	1.9 (1.1-2.9)
Ultra-low-declining	430 (1.6)	9	1.2	2.1 (1.0-3.9)	1	0.5	0.2 (0.0-1.3)
Overall	2,092	64	2.9	3.1 (2.4-3.9)	56	2.0	2.7 (2.0-3.5)
All Normal weight (N=36,978)							
Elevated-stable	1,272 (4.7)	128	10.5	10.1 (8.5-11.8)	186	13.5	14.6(12.7-16.7)
Moderate-stable	6,545 (24.2)	372	6.7	5.7 (5.1-6.3)	458	7.0	7.0 (6.4-7.6)
Low-increasing	6,720 (24.8)	279	4.2	4.2 (3.7-4.7)	219	3.4	3.3 (2.8-3.7)
Moderate-fast-decline	3,822 (14.1)	122	3.7	3.2 (2.7-3.8)	121	2.9	3.2 (2.6-3.8)
Low-declining	15,273 (56.4)	358	2.4	2.3 (2.1-2.6)	215	1.4	1.4 (1.2-1.6)
Ultra-low-declining	3,346 (12.4)	43	1.3	1.3 (0.9-1.7)	18	0.5	0.5 (0.3-0.8)
Overall	36,978	1,302	3.8	3.5 (3.3-3.7)	1,217	3.2	3.3 (3.1-3.5)
All Overweight (N=20,148)							
Elevated-stable	1,527 (5.6)	150	11.2	9.8 (8.4-11.4)	242	14.9	15.8(14.1-17.8)
Moderate-stable	5,900 (21.8)	420	7.1	7.1 (6.5-7.8)	483	7.4	8.2 (7.5-8.9)
Low-increasing	4,386 (16.2)	180	4.3	4.1 (3.5-4.7)	159	3.6	3.6 (3.1-4.2)
Moderate-fast-decline	2,162 (8.0)	87	3.9	4.0 (3.2-4.9)	58	3.1	2.7 (2.0-3.5)
Low-declining	5,580 (20.6)	139	2.4	2.5 (2.1-2.9)	94	1.4	1.7 (1.4-2.1)
Ultra-low-declining	593 (2.2)	5	1.3	0.8 (0.3-2.0)	7	0.6	1.2 (0.5-2.4)
Overall	20,148	981	5.0	4.9 (4.6-5.2)	1,043	4.8	5.2 (4.9-5.5)
All Obesity (N=15,056)							
Elevated-stable	2,325 (8.6)	310	12.5	13.3 (12.0-14.8)	400	17.5	17.2(15.7-18.8)
Moderate-stable	5,964 (22.0)	511	8.1	8.6 (7.9-9.3)	547	9.0	9.2 (8.5-9.9)
Low-increasing	2,982 (11.0)	166	5.0	5.6 (4.8-6.5)	136	4.3	4.6 (3.8-5.4)
Moderate-fast-decline	1,449 (5.3)	70	4.4	4.8 (3.8-6.1)	59	3.6	4.1 (3.1-5.2)
Low-declining	2,208 (8.2)	66	2.6	3.0 (2.3-3.8)	50	1.7	2.3 (1.7-3.0)
Ultra-low-declining	128 (0.5)	0	1.3	0.0 (0.0-2.8)	2	0.6	1.6 (0.2-5.5)
Overall	15,056	1,123	6.9	7.5 (7.0-7.9)	1,194	7.7	7.9 (7.5-8.4)

Table S13. Models for Early Pregnancy Blood Pressure Trajectory Groups Plus Risk Factors Among Women with Diabetes with or without Other Risk Factors: Average Predicted Probabilities (n, %) and the Observed Incidence Rate (n, % and 95% Confidence Intervals) of Preeclampsia and Gestational Hypertension within the Internal Validation Sample (n=74,274) of Low-to-Moderate Risk Women. USPSTF Moderate Risk Factors = Black race, Obesity, Nulliparity, Age ≥35 years, Low income/Government insurance, or Pregestational Diabetes

BP Trajectory Groups	N (col %) women	Pre- eclampsia n	Average Predicted %	Observed % (95% CI)	Gestational Hypertension n	Average Predicted %	Observed % (95% CI)
Pregestational Diabetes with or without Risk Factors (N=478)							
Elevated-stable	65 (13.6)	13	25.8	20.0(11.1-31.8)	13	16.5	20.0(11.1-31.8)
Moderate-stable	179 (37.4)	28	18.9	15.6(10.7-21.8)	14	9.3	7.8 (4.3-12.8)
Low-increasing	89 (18.6)	12	12.8	13.5 (7.2-22.4)	8	4.7	9.0 (4.0-16.9)
Moderate-fast-decline	68 (14.2)	7	10.1	10.3 (4.2-20.1)	4	3.9	5.9 (1.6-14.4)
Low-declining	61 (12.8)	7	7.0	11.5 (4.7-22.2)	5	1.9	8.2 (2.7-18.1)
Ultra-low-declining	16 (3.3)	0	3.2	0.0 (0.0-20.6)	0	0.6	0.0 (0.0-20.6)
Overall	478	67	15.4	14.0(11.0-17.5)	44	7.4	9.2 (6.8-12.2)

Table S14. Sensitivity Analysis of Model Predictive Performance for Hypertensive Disorders of Pregnancy Utilizing Six Early Pregnancy Systolic Blood Pressure Trajectories Based on ≤ 4 , ≤ 3 , and ≤ 2 Blood Pressure Measurements. C-statistics and 95% Confidence Intervals (95% CIs); N=74,967 Validation Dataset of Low-to-Moderate Risk Women.

Maximum Number of BPs used to determine BPT group	Model number	Prediction Model C-statistics (95%CI)		
		Early-onset Preeclampsia (<34 weeks)	Late-onset Preeclampsia (≥ 34 weeks)	Gestational Hypertension
All available (main results)	3.0	0.711 (0.682-0.739)	0.665 (0.656-0.674)	0.734 (0.726-0.742)
	3.1	0.739 (0.710-0.767)	0.725 (0.717-0.734)	0.764 (0.756-0.772)
	3.2	0.747 (0.720-0.775)	0.730 (0.722-0.739)	0.768 (0.761-0.776)
	3.3	0.747 (0.719-0.775)	0.731 (0.723-0.740)	0.770 (0.762-0.778)
4	3.0	0.702 (0.674-0.730)	0.662 (0.653-0.671)	0.730 (0.722-0.738)
	3.1	0.732 (0.704-0.760)	0.724 (0.715-0.732)	0.761 (0.754-0.769)
	3.2	0.743 (0.715-0.770)	0.729 (0.720-0.737)	0.766 (0.758-0.774)
	3.3	0.742 (0.714-0.770)	0.730 (0.721-0.738)	0.767 (0.760-0.775)
3	3.0	0.693 (0.664-0.722)	0.657 (0.647-0.666)	0.730 (0.722-0.738)
	3.1	0.726 (0.697-0.755)	0.720 (0.712-0.729)	0.762 (0.754-0.769)
	3.2	0.734 (0.705-0.763)	0.726 (0.717-0.734)	0.766 (0.759-0.774)
	3.3	0.734 (0.705-0.763)	0.727 (0.718-0.735)	0.768 (0.760-0.776)
2	3.0	0.682 (0.654-0.710)	0.650 (0.641-0.660)	0.718 (0.710-0.726)
	3.1	0.719 (0.690-0.748)	0.717 (0.708-0.725)	0.752 (0.744-0.760)
	3.2	0.727 (0.698-0.756)	0.722 (0.713-0.730)	0.757 (0.749-0.765)
	3.3	0.726 (0.697-0.755)	0.723 (0.714-0.732)	0.759 (0.751-0.767)
<p>Abbreviations: BP, blood pressure; BMI, pre-pregnancy body mass index; BPT, blood pressure trajectory</p> <p>Standard Risk factors: pre-pregnancy BMI (kg/m²), parity (0 vs ≥ 1), maternal age (years), racial and ethnic groups [Black, Hispanic, Asian, White (referent), Mixed/Native/unknown], and pregestational diabetes;</p> <p>Lifestyle Behaviors: Smoking during pregnancy, and Rate of gestational weight gain (GWG) ≤ 20 weeks' gestation (kg per week).</p> <p>Social Factors: Government health insurance and Neighborhood deprivation index.</p> <p>C-statistics for Model 3: Six BPT groups Only, or BPT groups plus Standard Risk Factors, Lifestyle Behaviors and Social Factors.</p> <p>The total number (N) missing covariables for the prediction model (validation dataset) is 693.</p>				

Table S15. Sensitivity Analysis - Model Predictive Performance for Hypertensive Disorders of Pregnancy Utilizing Six Early Pregnancy Systolic Blood Pressure Trajectory Groups Limited to Blood Pressures measured up to 16 Weeks' Gestation (BPTL groups) and Risk Factors Available in Routine Prenatal Care (Clinical, Behavioral, and Social) Among Low-to-Moderate Risk Pregnant Women. C-statistics and (95% Confidence Intervals); N=74,913 validation dataset.

Model number	Predictive Model Variables	Prediction Model C-statistics (95%CI)		
		Early-onset Preeclampsia (<34 weeks)	Late-onset Preeclampsia (≥34 weeks)	Gestational Hypertension
1.0.	Standard Risk Factors:(BMI + Parity + Age + Race/ethnicity + Diabetes)	0.688 (0.659-0.717)	0.695 (0.686-0.704)	0.692 (0.683-0.701)
2.0.	Initial BP Only	0.657 (0.626-0.687)	0.631 (0.621-0.641)	0.701 (0.692-0.709)
2.1.	Initial BP + BMI + Parity	0.704 (0.675-0.733)	0.708 (0.700-0.717)	0.738 (0.730-0.746)
2.2.	Initial BP + BMI + Parity + Age + Race/ethnicity + Diabetes	0.713 (0.685-0.741)	0.714 (0.705-0.722)	0.744 (0.736-0.752)
3.0.	Six BPTL groups Only	0.705 (0.677-0.733)	0.656 (0.647-0.665)	0.723 (0.715-0.731)
3.1.	Six BPTL groups + BMI + Parity	0.737 (0.708-0.766)	0.720 (0.712-0.729)	0.757 (0.749-0.764)
3.2.	Six BPTL groups + Standard Risk Factors (BMI + Parity + Age + Race/ethnicity + Diabetes)	0.748 (0.721-0.775)	0.725 (0.716-0.733)	0.761 (0.753-0.769)
3.3.	Six BPTL groups + Standard Risk factors (BMI + Parity + Age + Race/ethnicity + Diabetes) + Lifestyle Behaviors + Social Factors	0.748 (0.721-0.775)	0.726 (0.718-0.735)	0.763 (0.755-0.771)

Abbreviations: BP, blood pressure; BMI, pre-pregnancy body mass index; BPTL, blood pressure trajectory groups limited to BP measurements from 0 to 16 weeks' gestation.

Standard Risk factors: pre-pregnancy BMI (kg/m²), parity (0 vs ≥1), maternal age (y), and racial and ethnic groups [Black, Hispanic, Asian, Mixed/Native/unknown, White (referent)], and pregestational Diabetes;

Lifestyle Behaviors: Smoking during pregnancy, and Rate of gestational weight gain (GWG) ≤ 20 weeks (kg per week)

Social Factors: Government insurance and Neighborhood deprivation index.

C-statistics for Model 1: Standard Risk factors, **Model 2:** Initial BP Only (≤14 weeks' gestation), or Initial BP plus Standard Risk Factors, and **Model 3:** Six BPTL groups Only, or BPTL groups plus Standard Risk Factors, and BPTL groups, Standard Risk Factors plus Lifestyle Behaviors and Social Factors. (Models Missing n = 54 women with no BP measurements ≤16 weeks' gestation).

Figure S1. Sample Selection Flow Chart

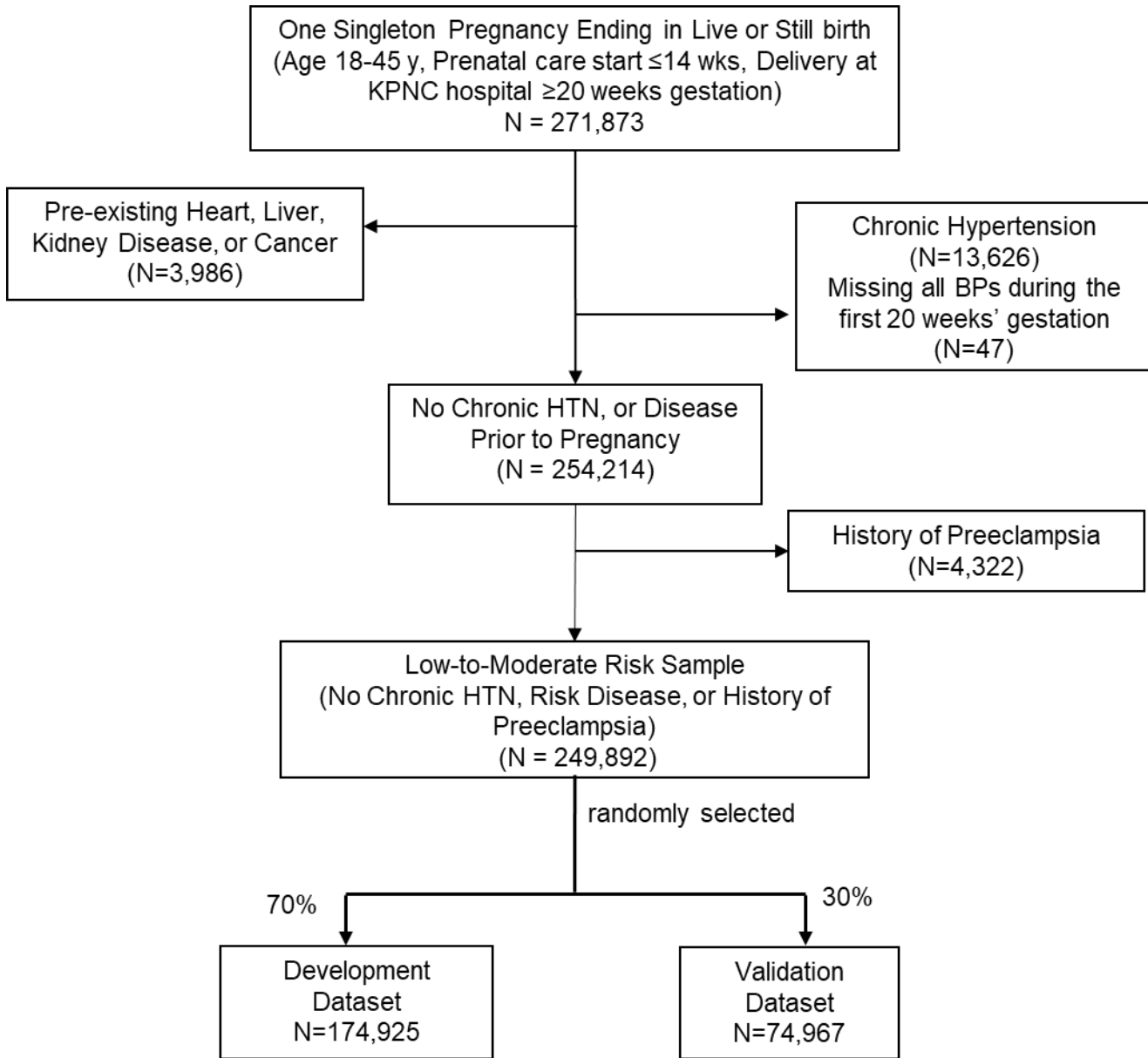
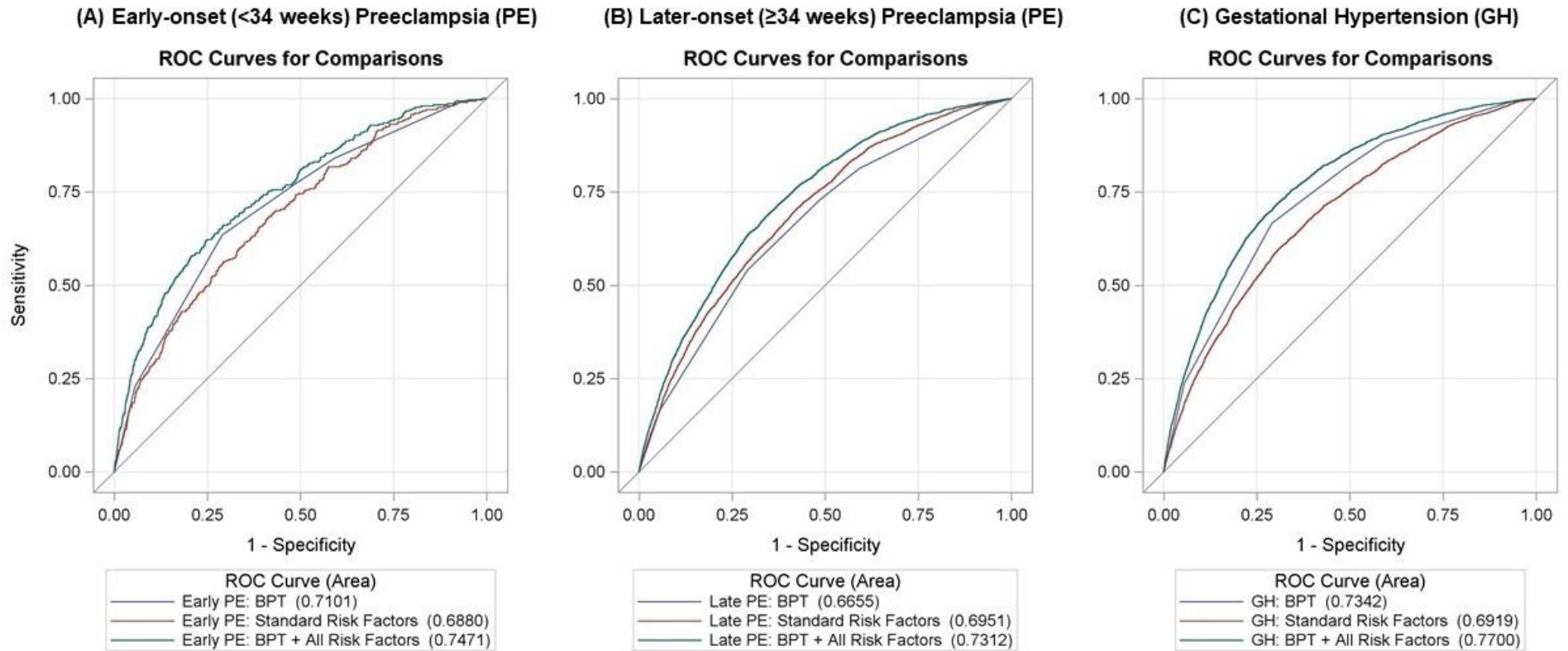


Figure S2: Receiver Operating Characteristic (ROC) Curves for the Predictive Models: (A) Early-onset preeclampsia (<34 weeks gestational age), (B) Later-onset preeclampsia (≥34 weeks gestational age), and (C) Gestational Hypertension.



Specific Models:

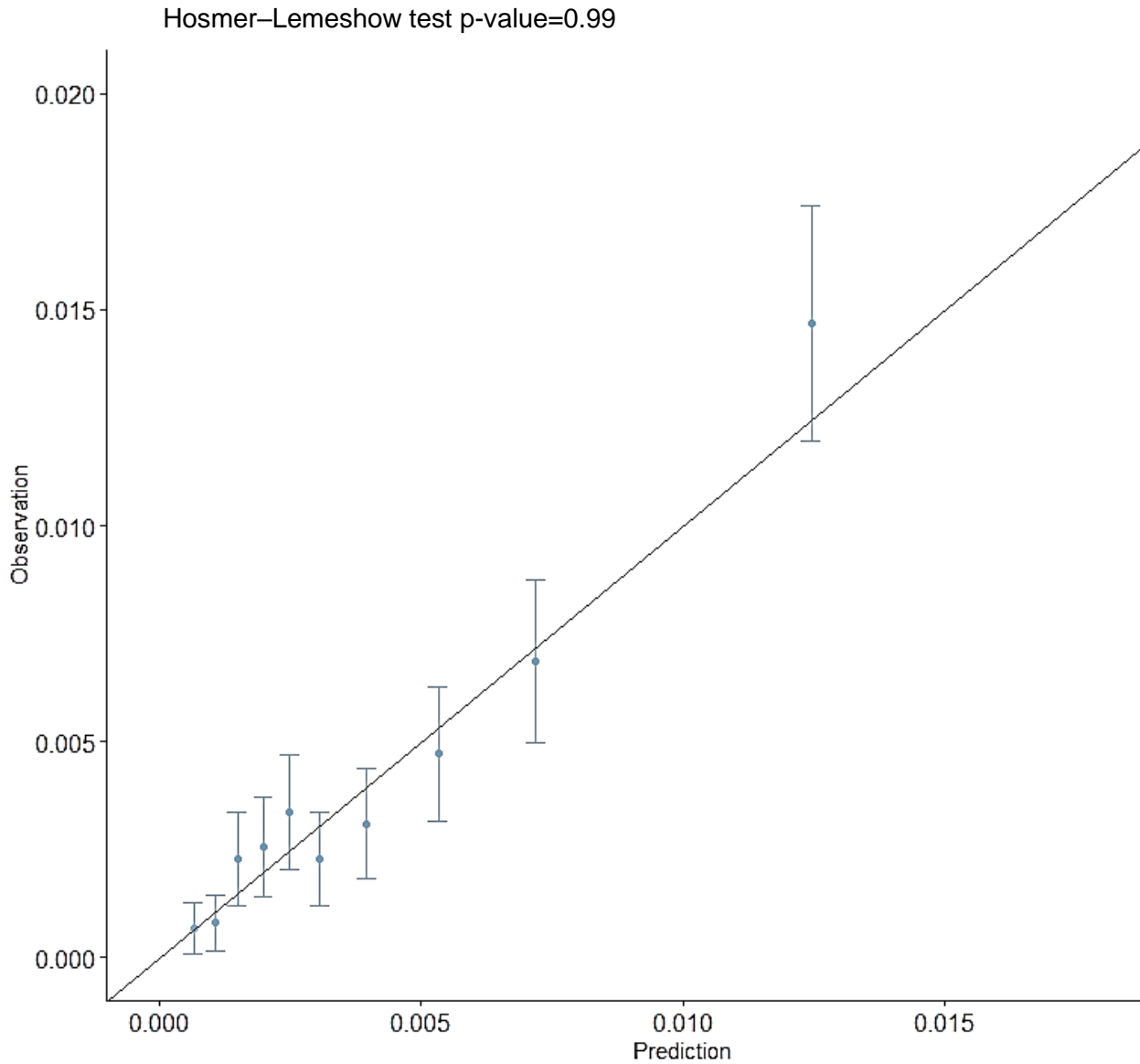
BPT Model (purple): Blood pressure trajectory groups.

Standard Risk Factors (red): BMI + Parity + Age + Race/ethnicity + Diabetes.

BPT + All Risk Factors Model (green): BMI + Parity + Age + Race/ethnicity + Diabetes + Lifestyle Behaviors + Social Factors

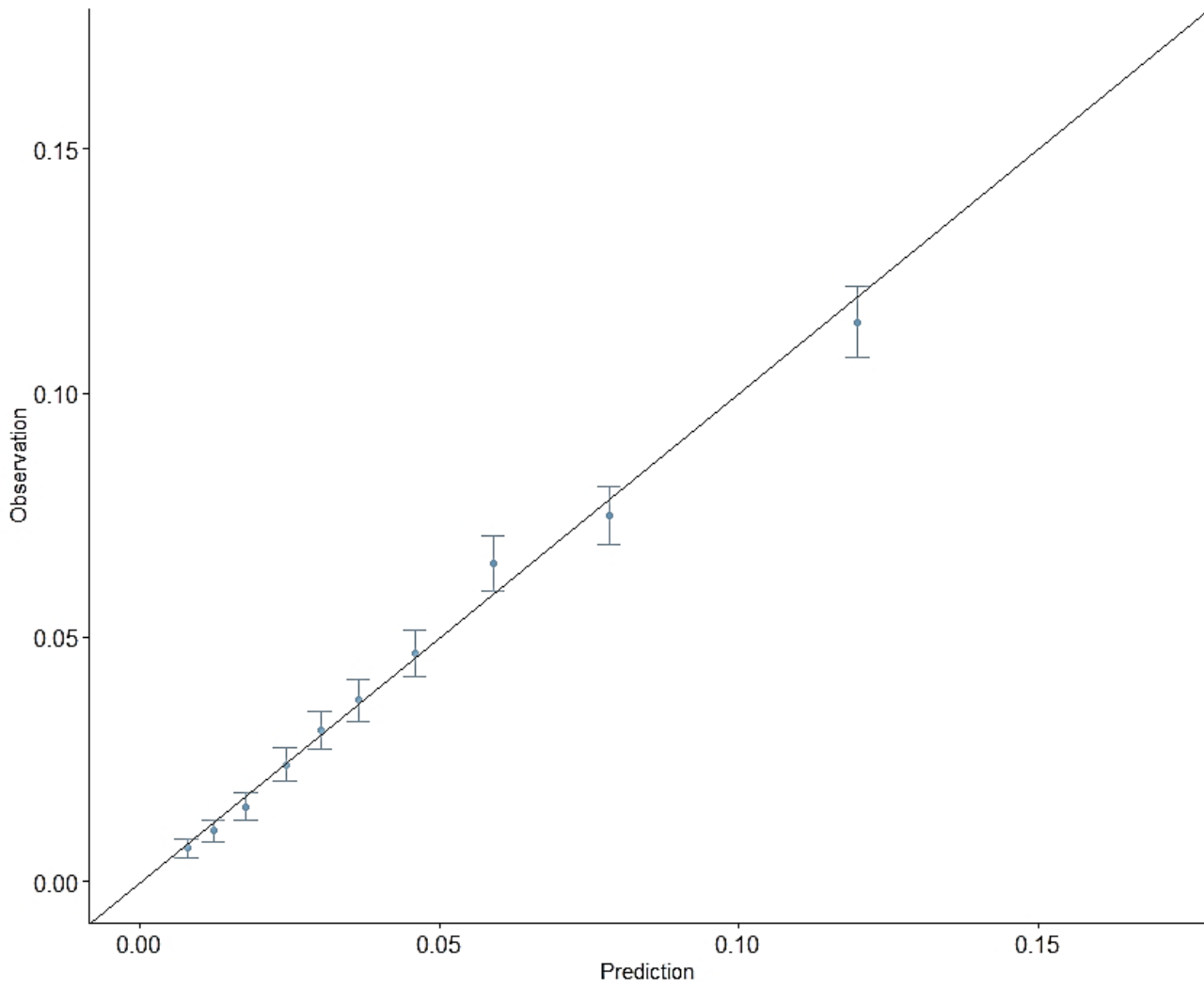
Figure S3. Decile Calibration Plots for Observation versus Prediction Models: (A) Early-onset preeclampsia <34 weeks gestational age; (B) Later-onset preeclampsia \geq 34 weeks gestational age; and (C) Gestational hypertension. Models include Early Pregnancy Systolic Blood Pressure Trajectory (BPT) Groups and All Risk Factors.

(A) Early-onset preeclampsia (BPT groups + All Risk Factors Model)



(B) Later-onset preeclampsia (BPT groups + All Risk Factors Model)

Hosmer-Lemeshow test p-value=0.99



C) Gestational hypertension (BPT groups + All Risk Factors).

Hosmer-Lemeshow test p-value=0.74

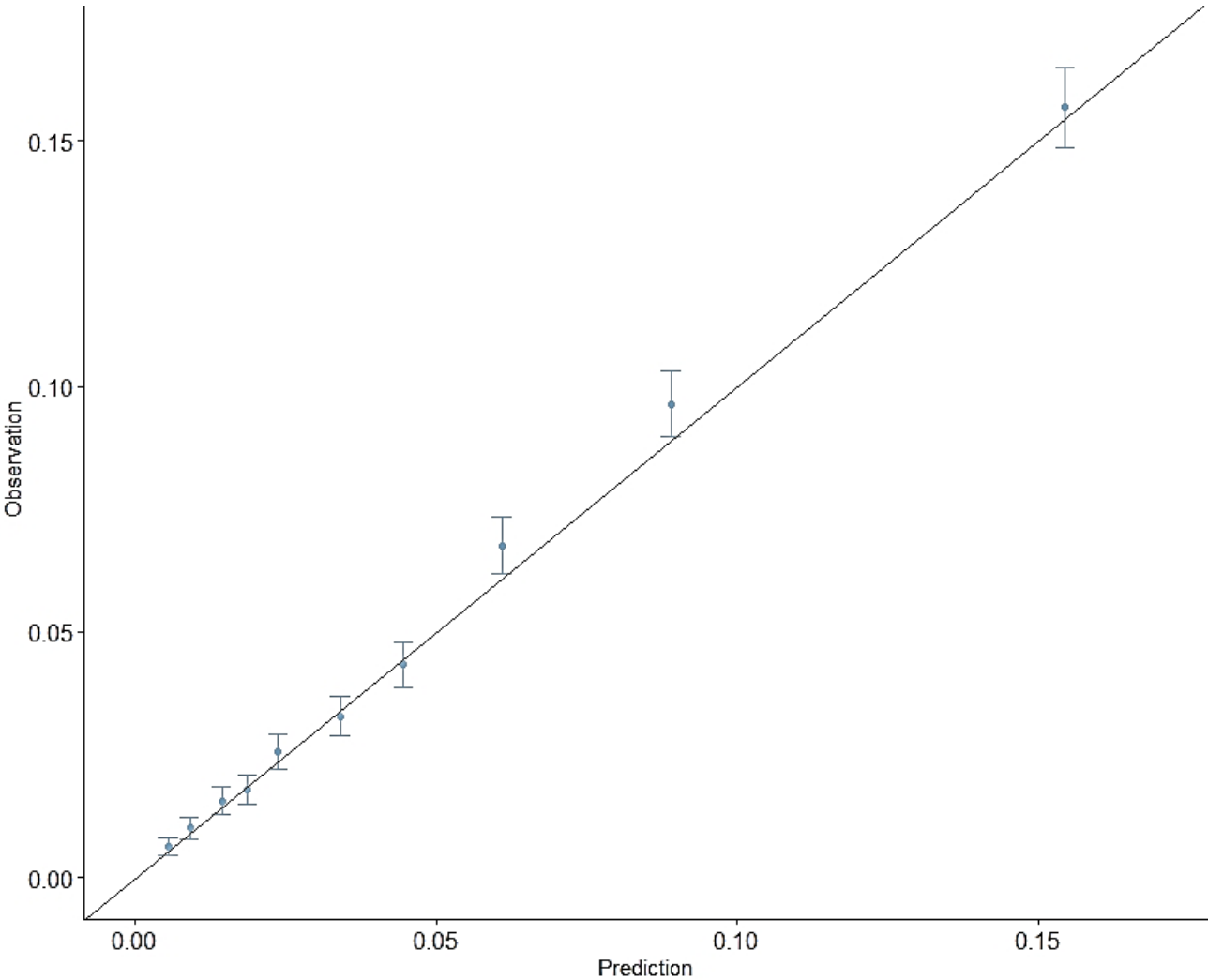


Figure S4. Distribution of Blood Pressure Measurements by Gestational Age; Percentage of Women with Two Blood Pressure (BP) Measurements, One Blood Pressure Measurement, or Any (One or More) Blood Pressure Measurements within Specific Gestational Age Intervals from 0-20 weeks of gestation.

