Sample Size Calculation and Optimal Design for Regression-Based Norming of Tests and Questionnaires.

Online Supplement B.1

Results of the Simulation Studies for Y=PNVFT

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We have no conflict of interest to disclose.

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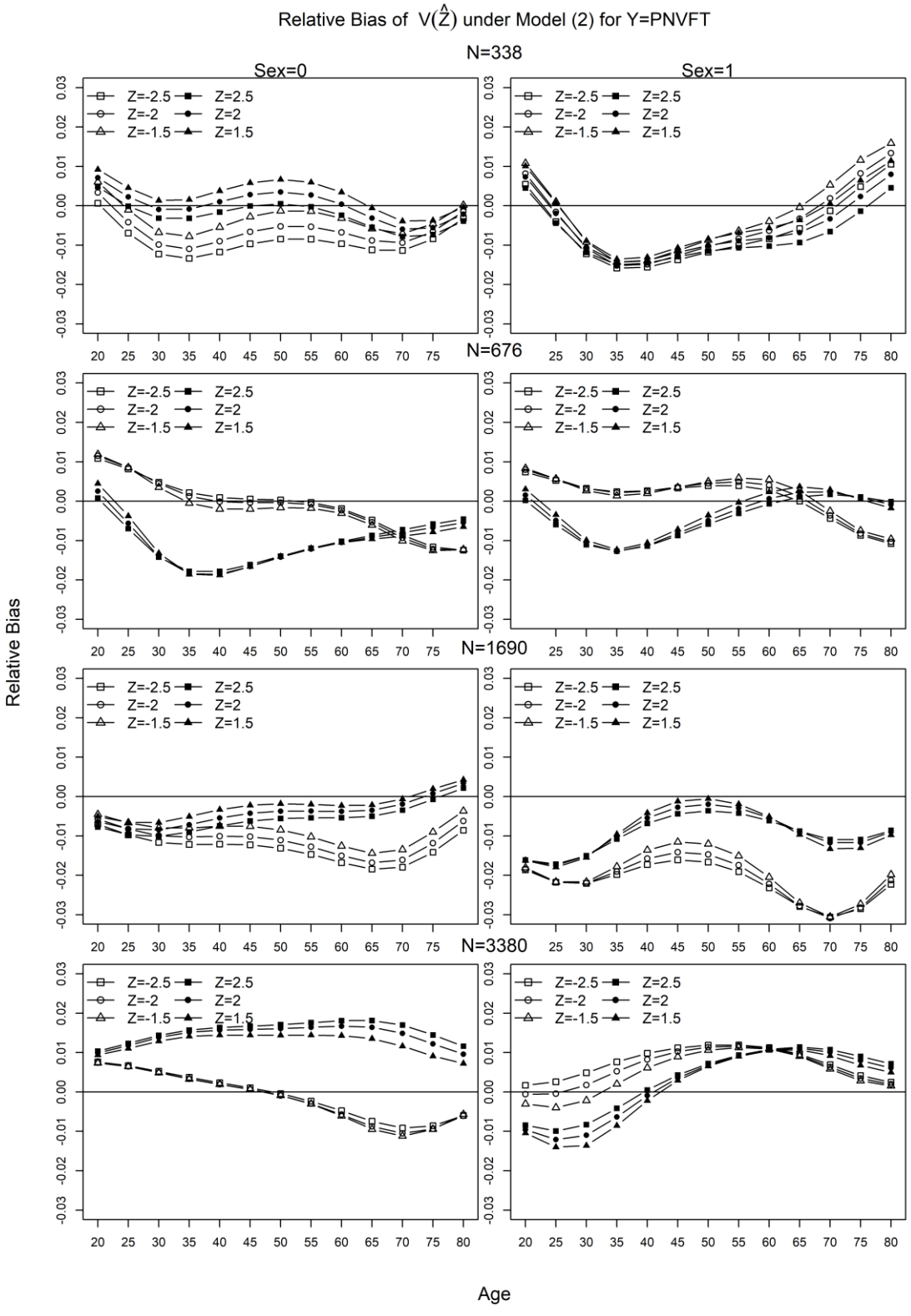


Figure S.B.1.1 Relative bias of equation (7), $V(\hat{Z})$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves)

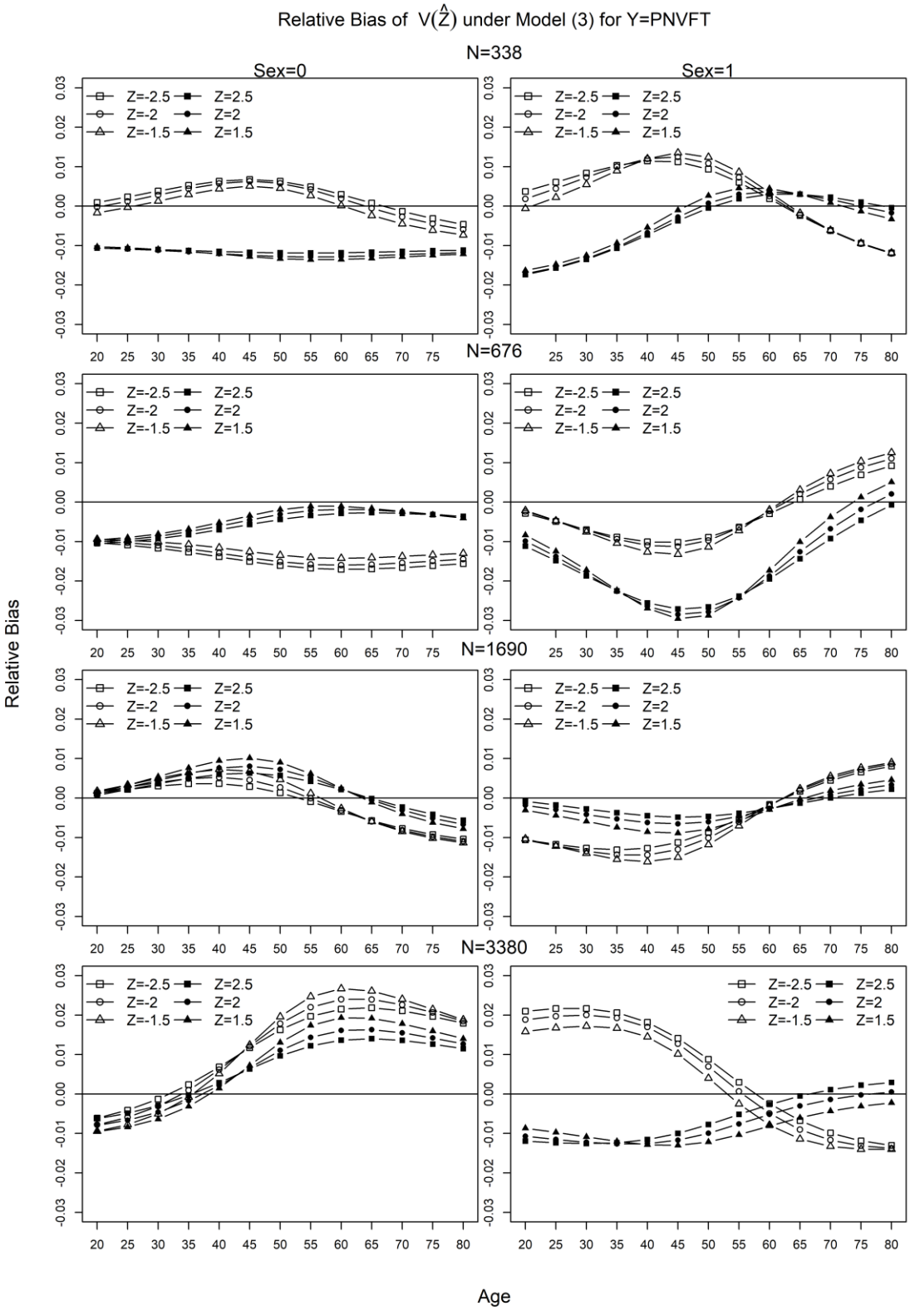
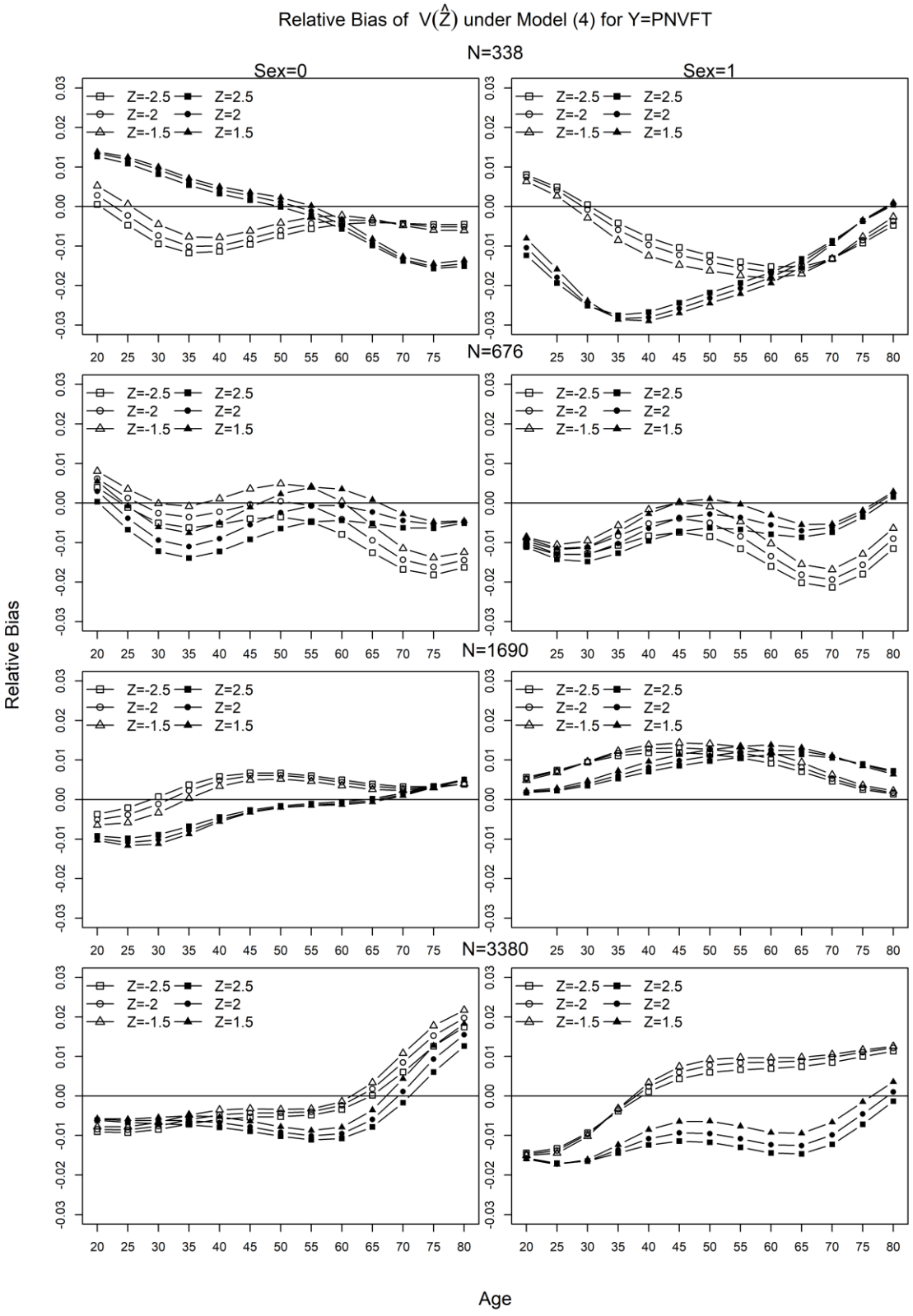


Figure S.B.1.2. Relative bias of equation (7), $V(\hat{Z})$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).



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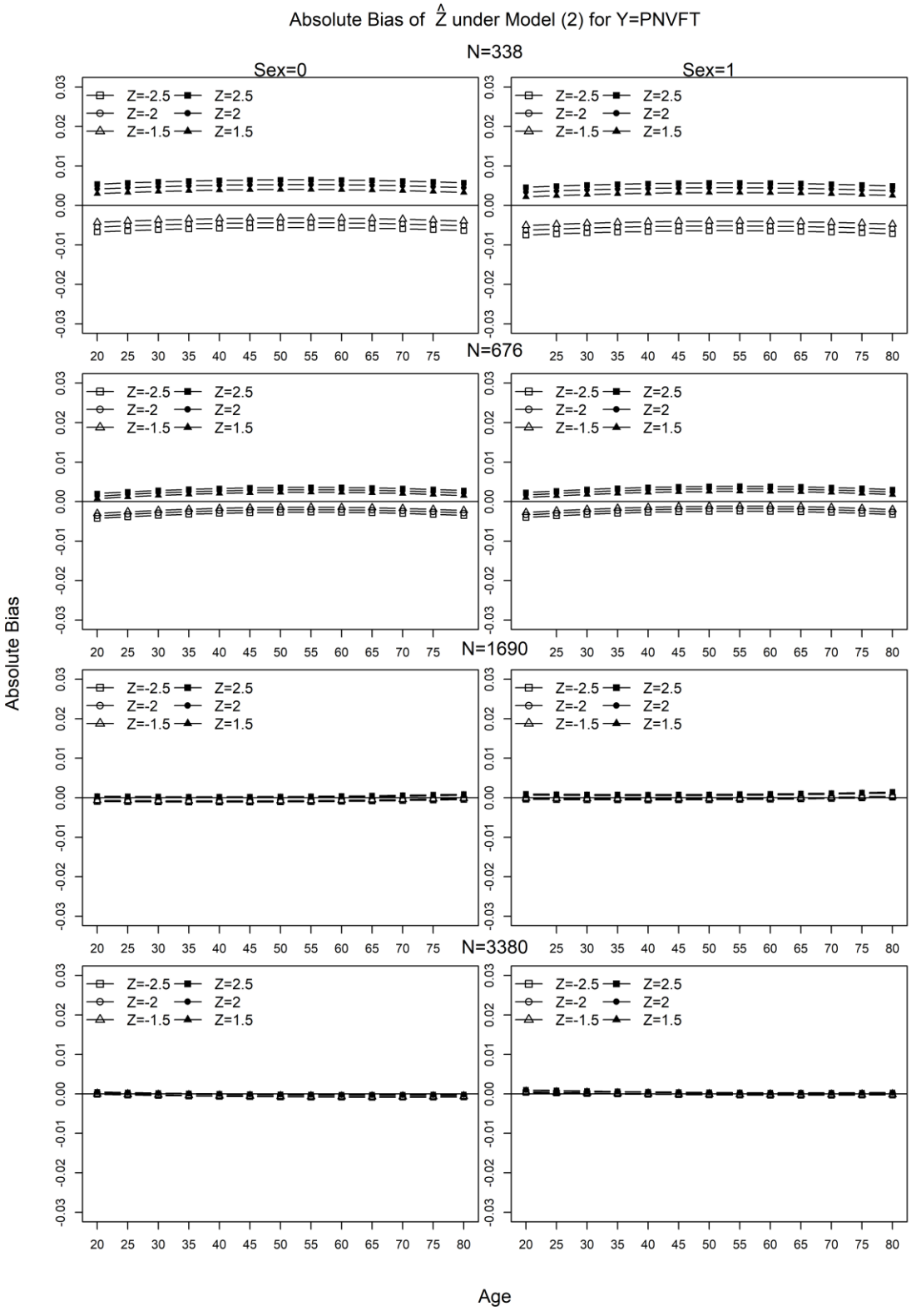
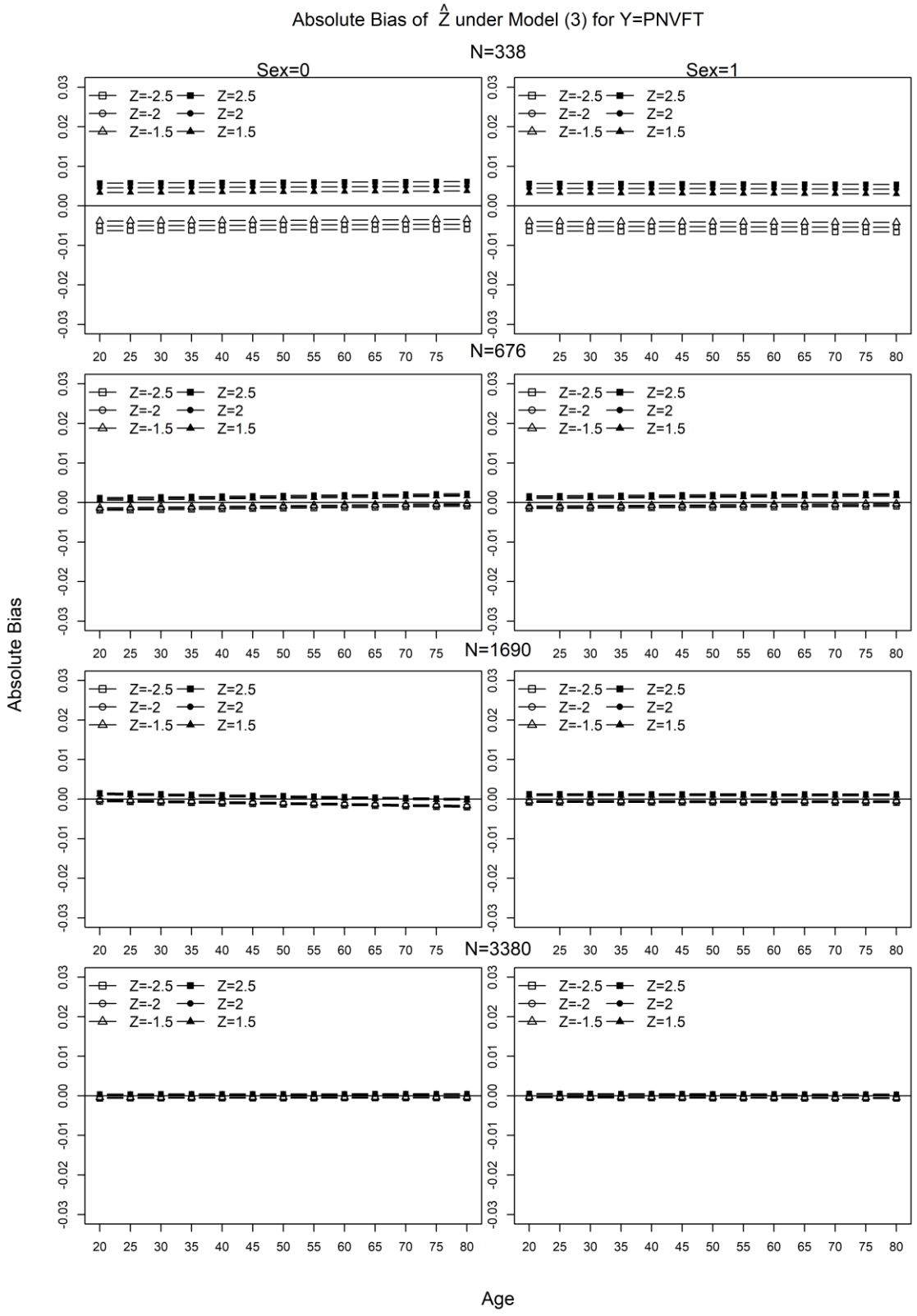


Figure S.B.1.4. Absolute bias of $\hat{Z}$, under model (2) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).



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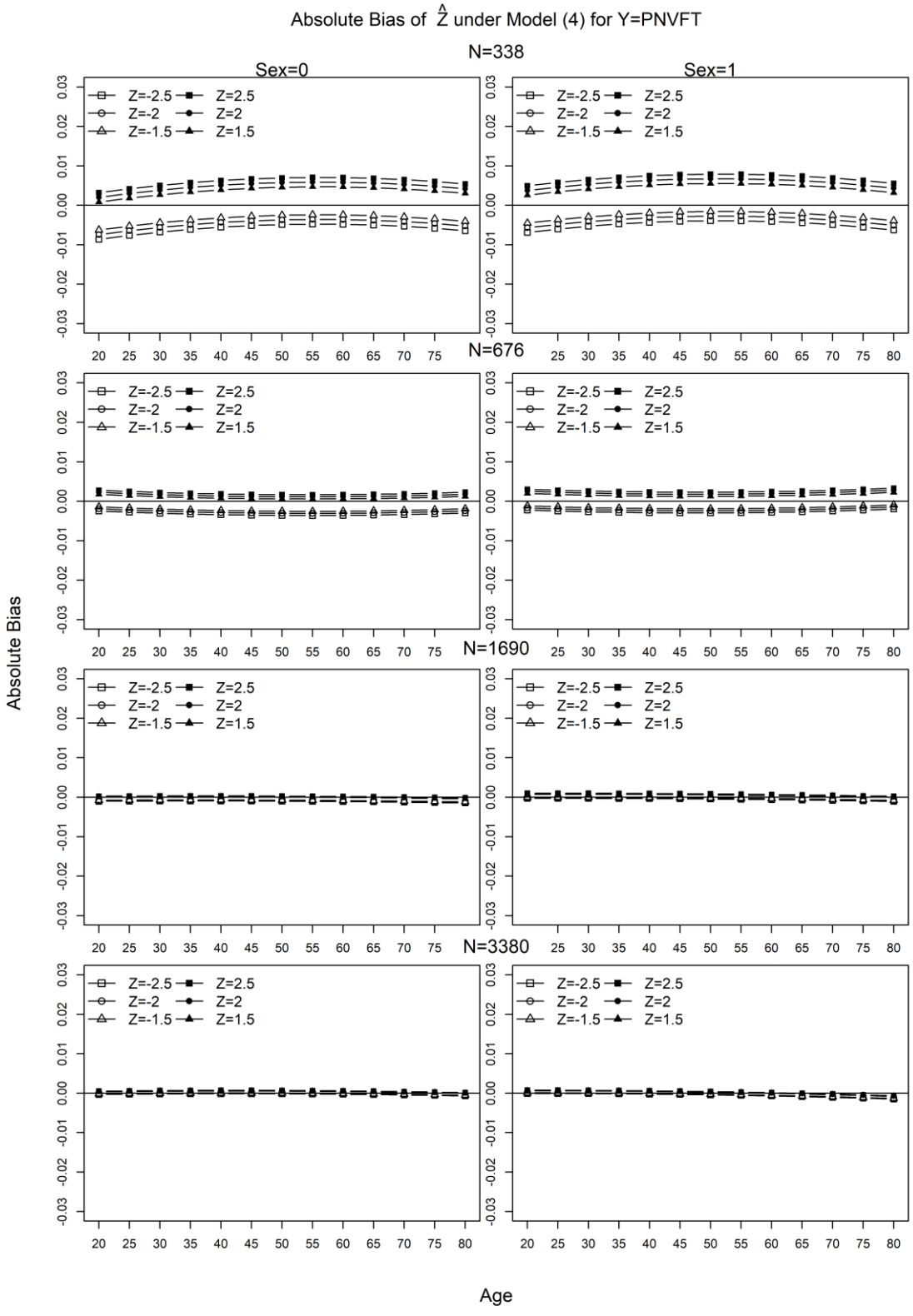
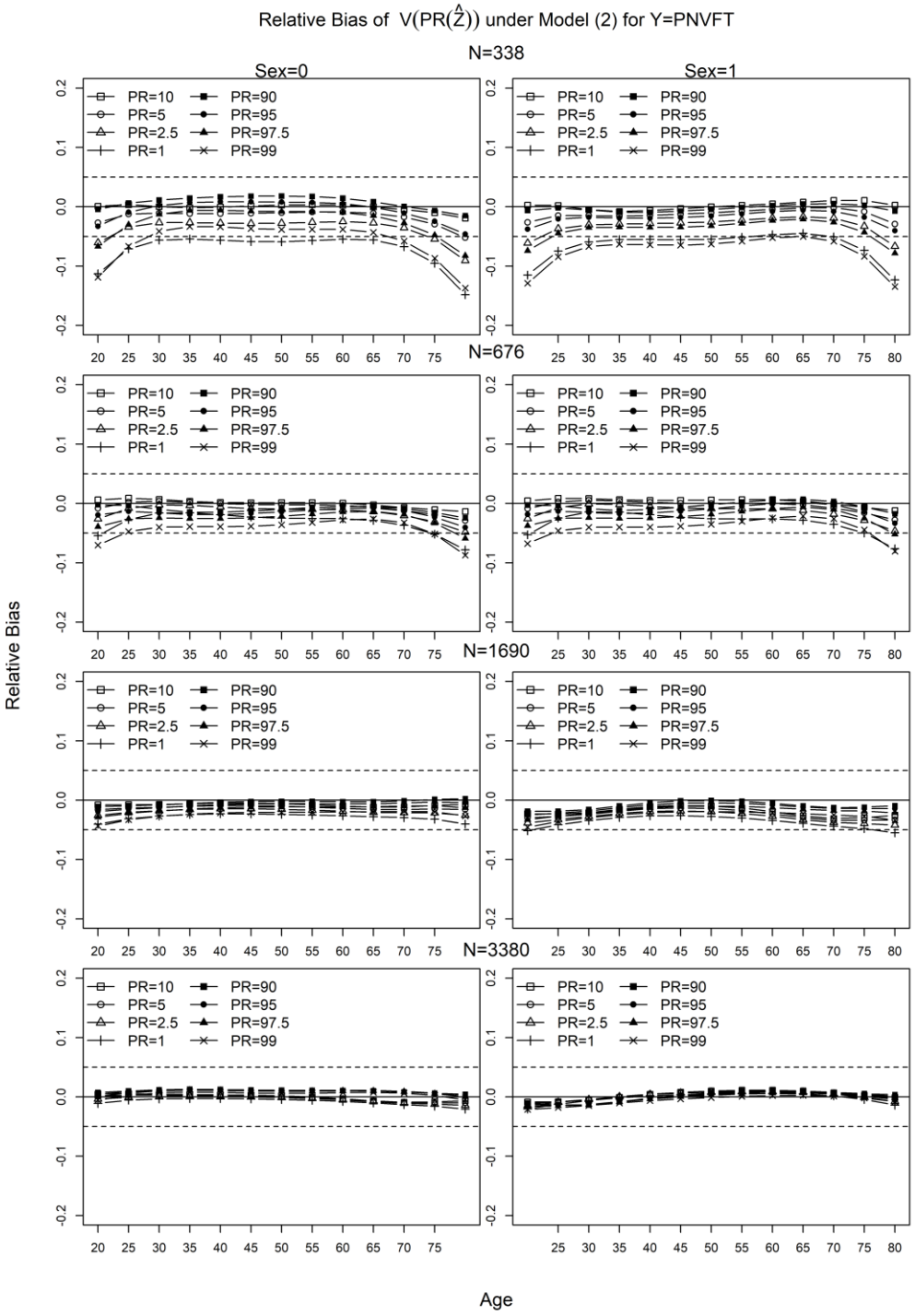


Figure S.B.1.6. Absolute bias of $\hat{Z}$, under model (4) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).



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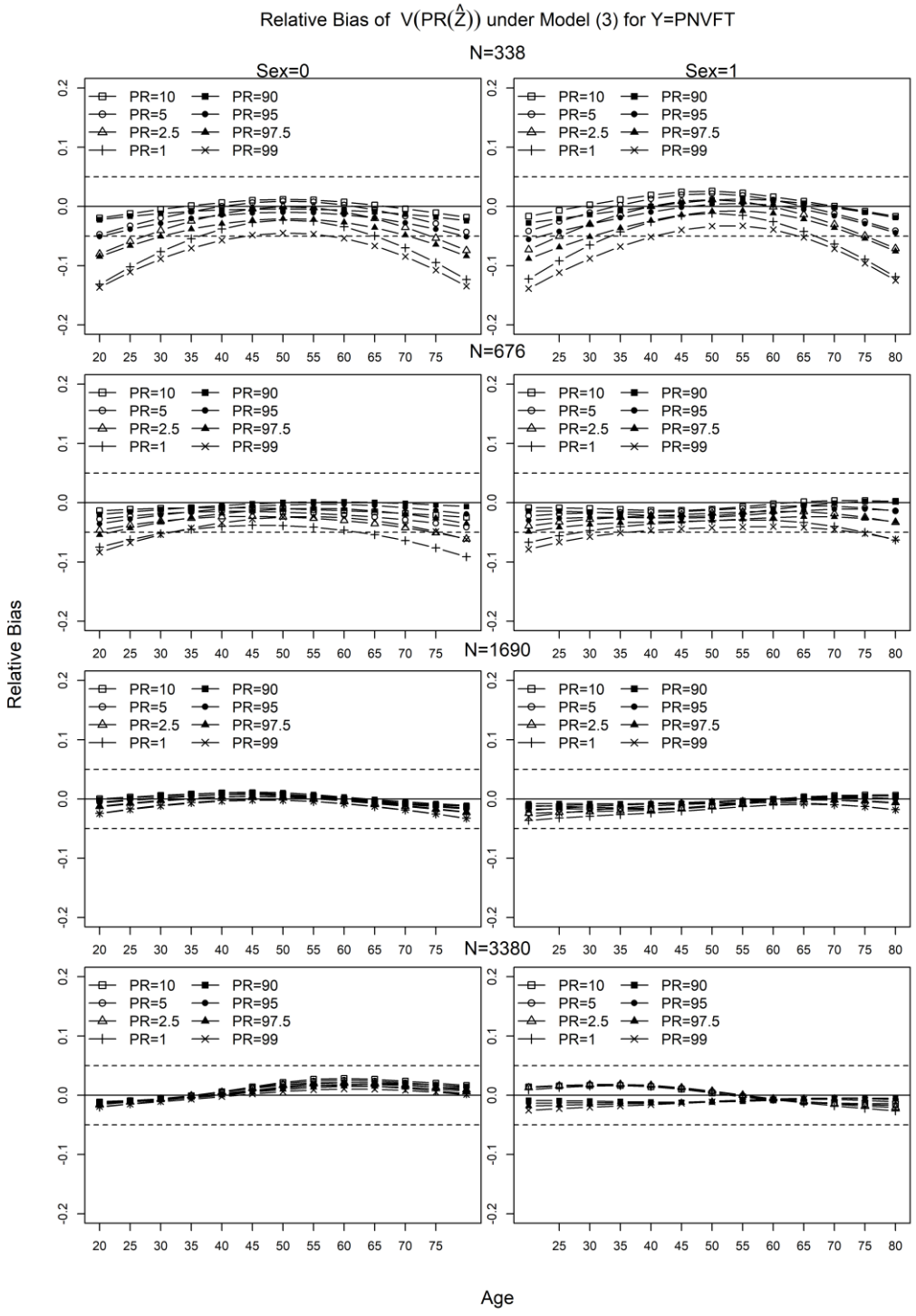

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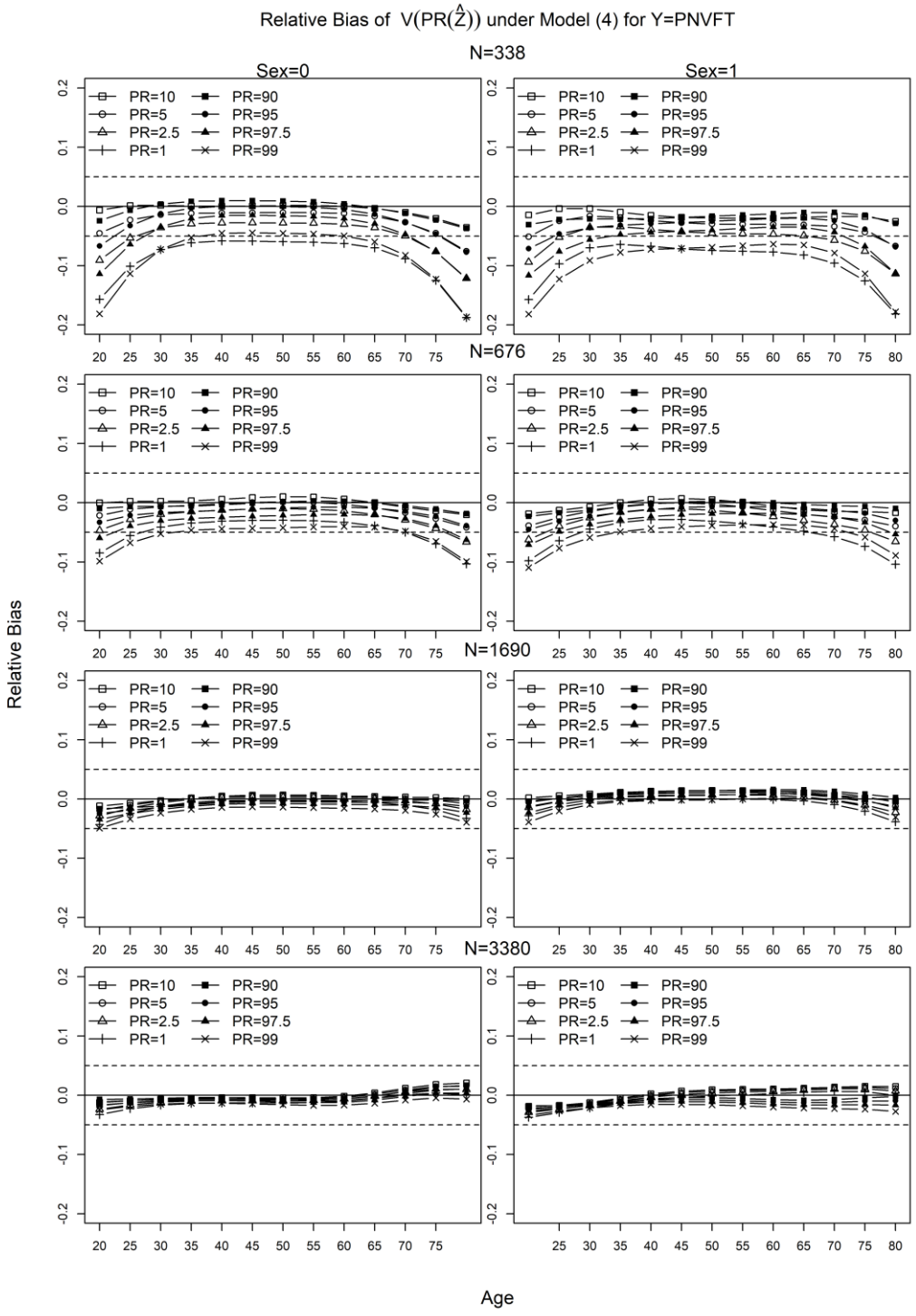

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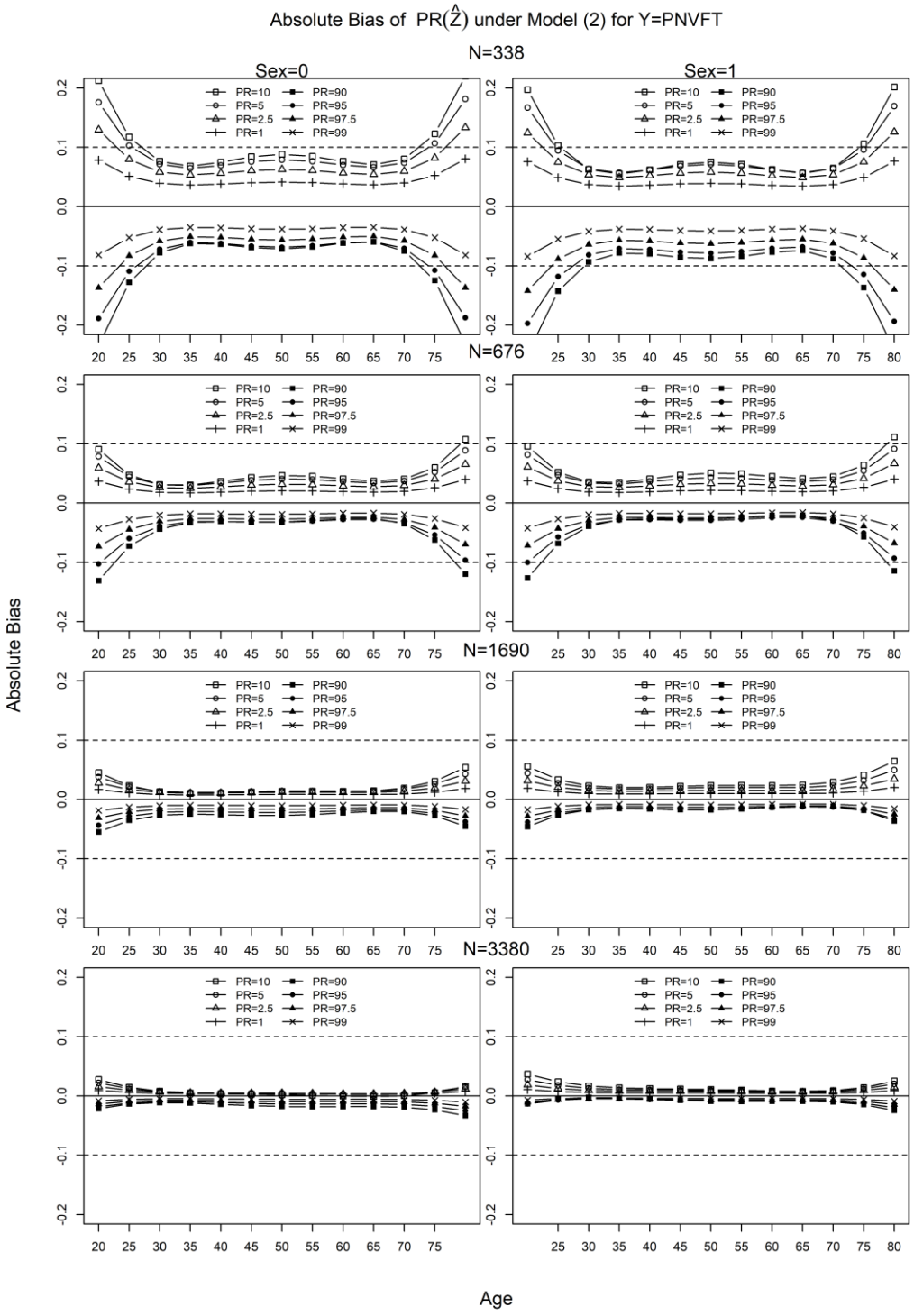

Figure S.B.1.10. Absolute bias of equation (6), $PR(\hat{Z})$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

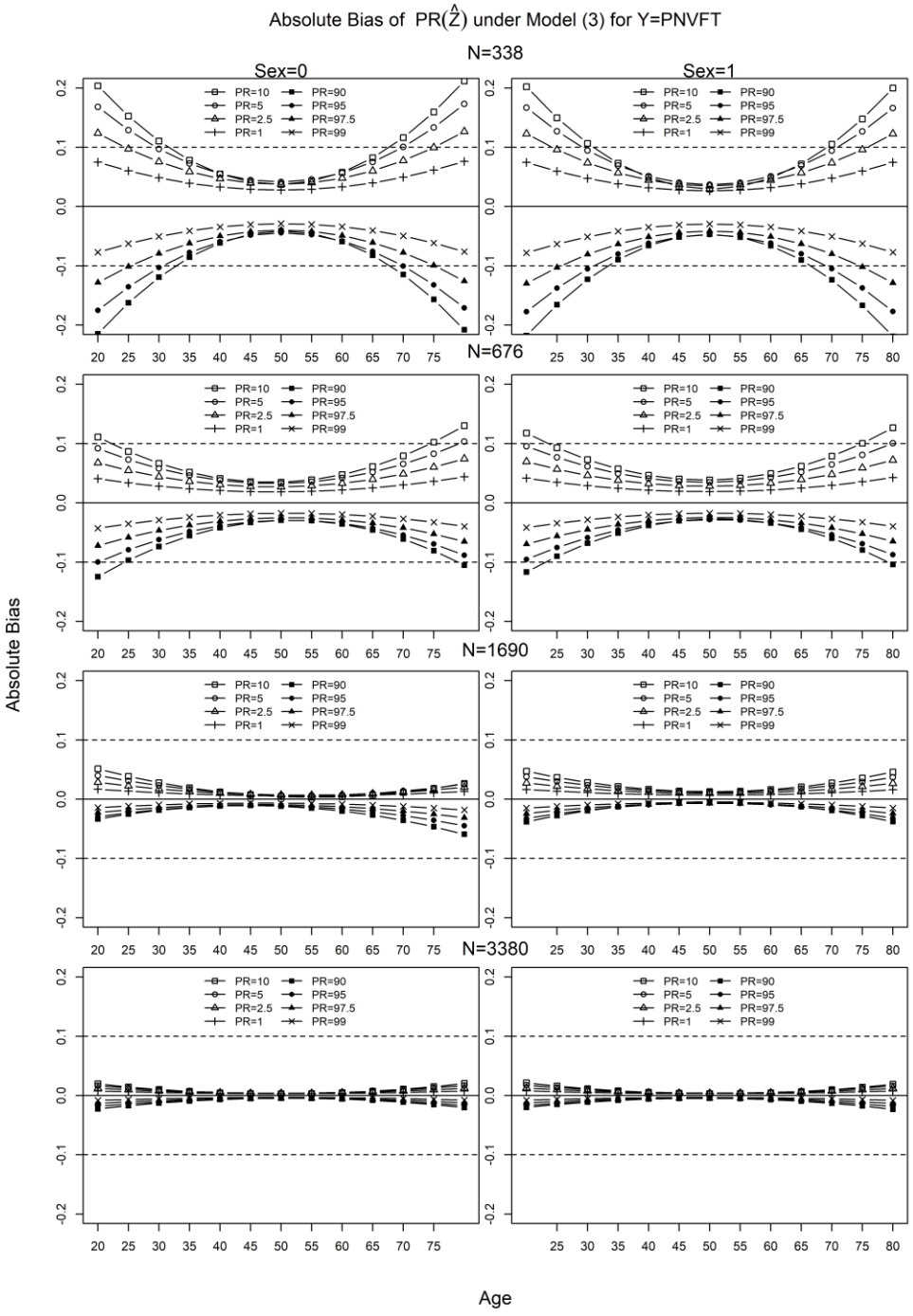

Figure S.B.1.11. Absolute bias of equation (6), $PR(\hat{Z})$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

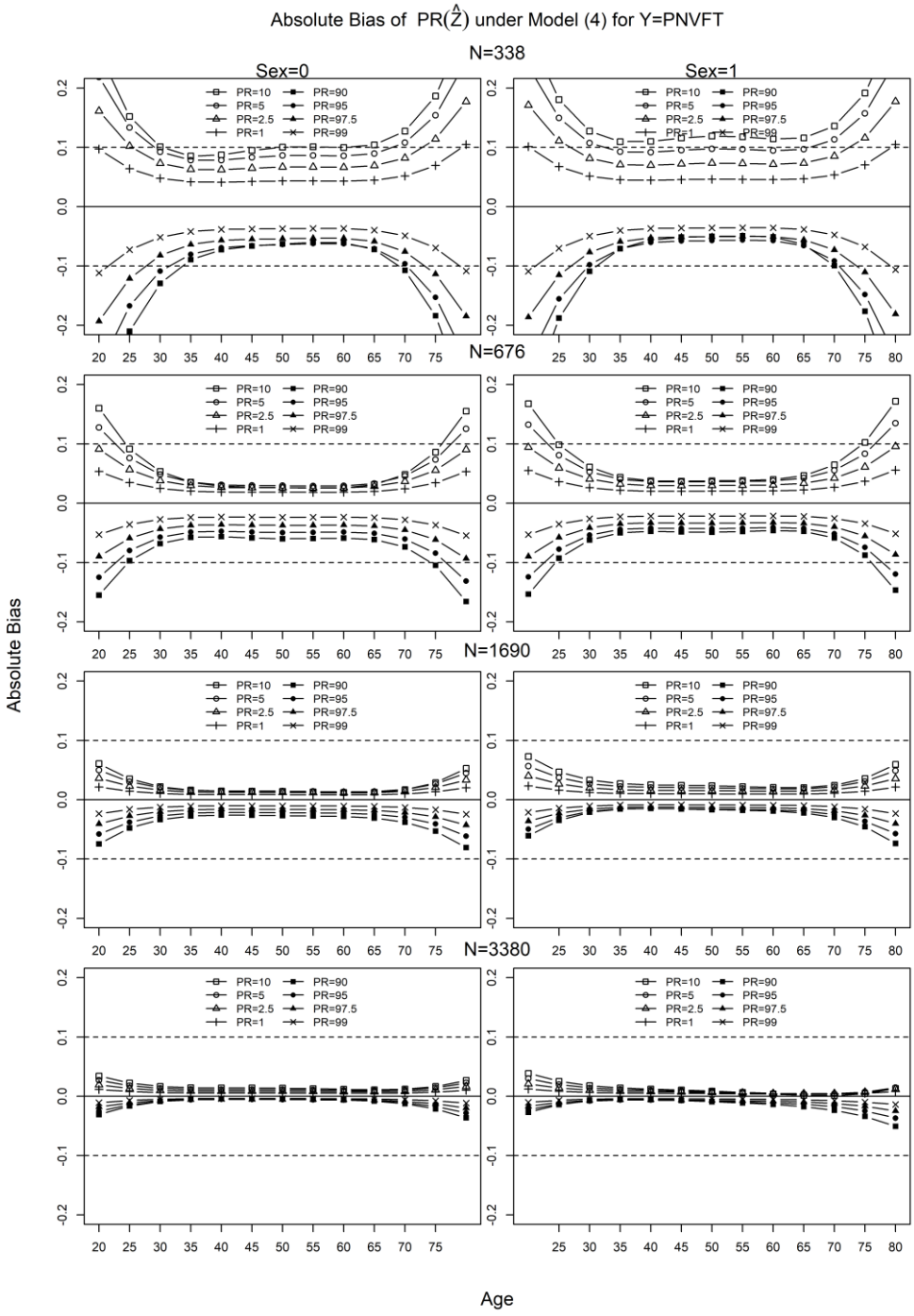

Figure S.B.1.12. Absolute bias of equation (6), $PR(\hat{Z})$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

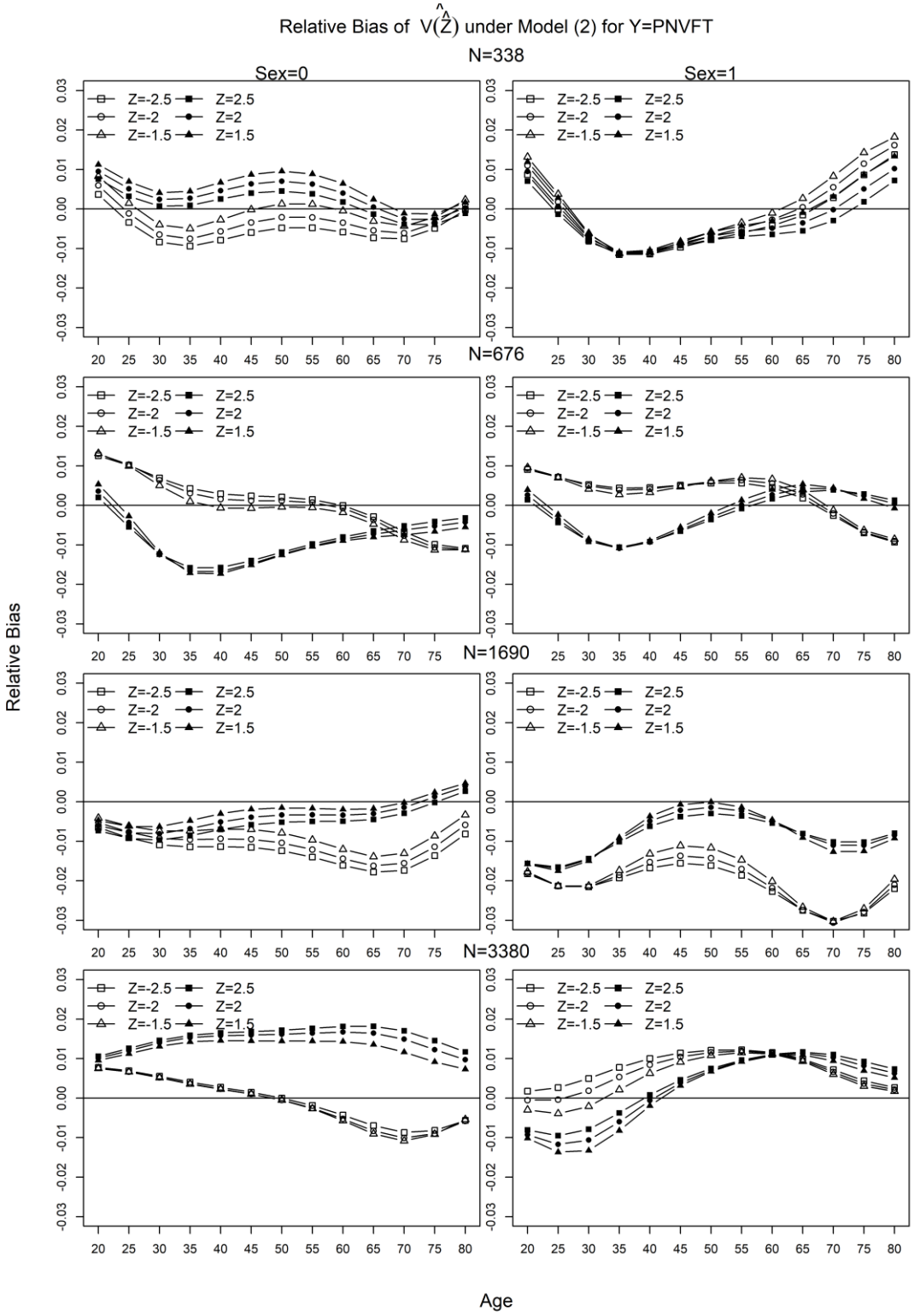

Figure S.B.1.13. Relative bias of equation (9), $\hat{V}(\hat{Z})$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

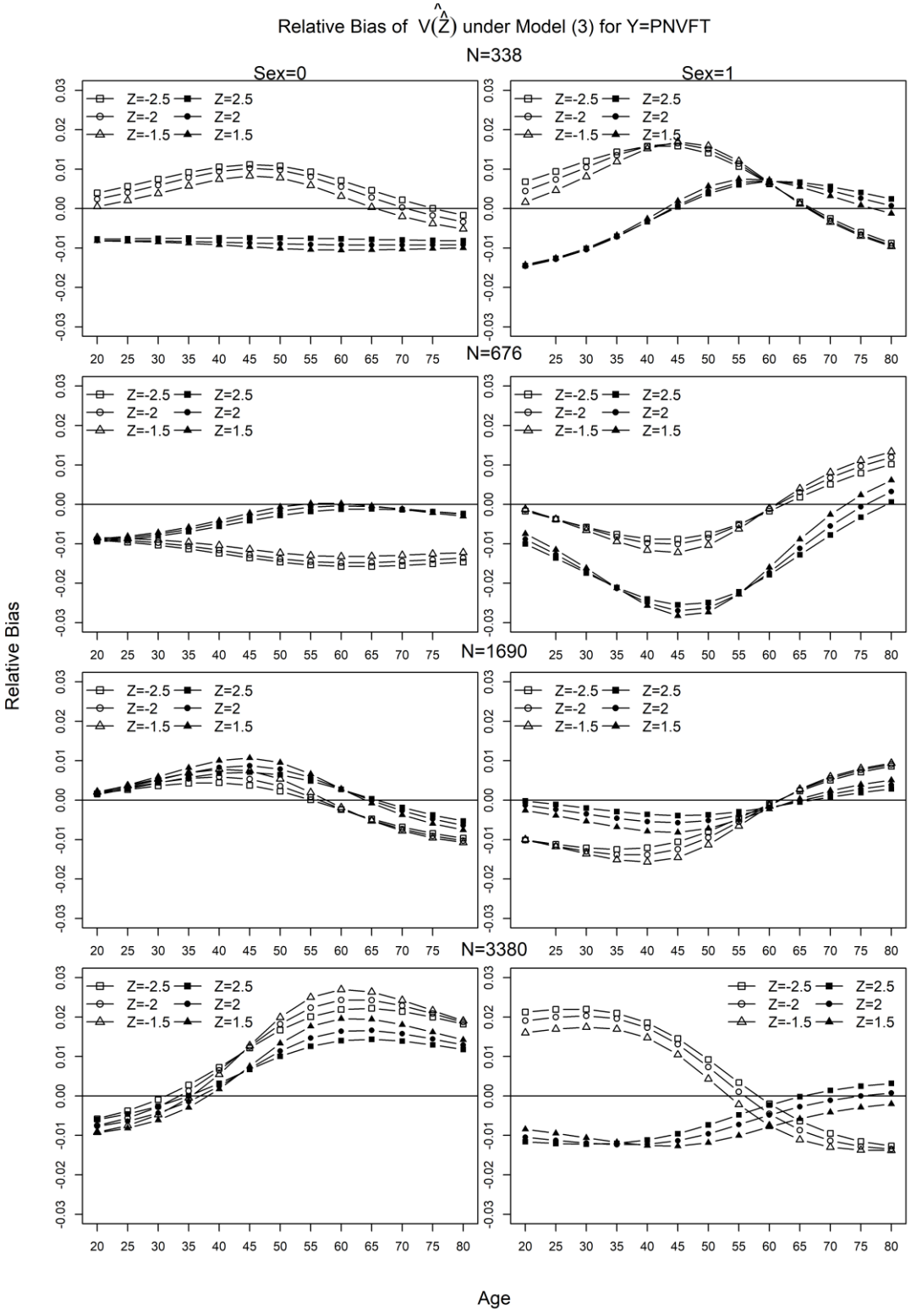

Figure S.B.1.14. Relative bias of equation (9), $\hat{V}(\hat{Z})$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

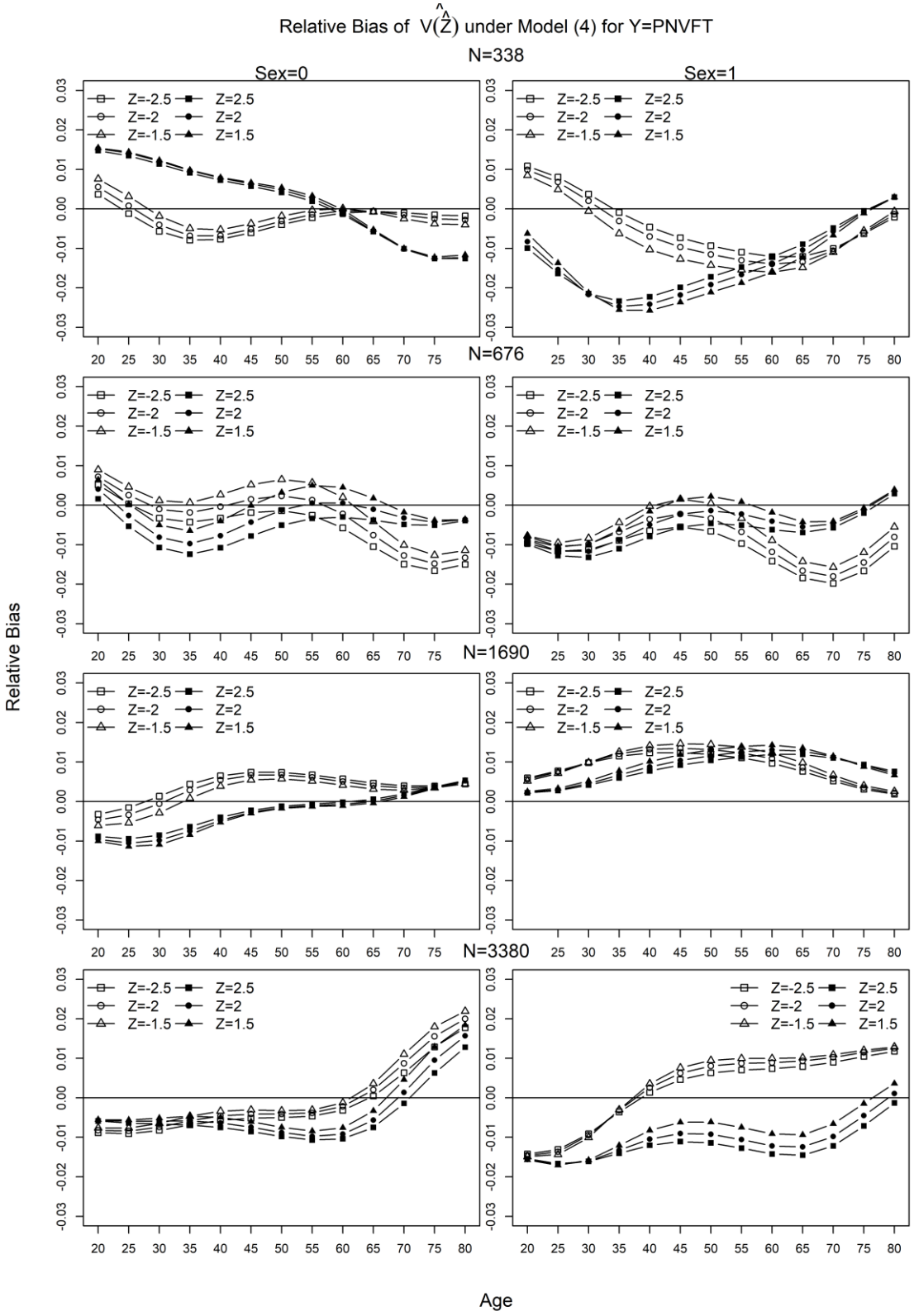

Figure S.B.1.15. Relative bias of equation (9), $\hat{V}(\hat{Z})$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

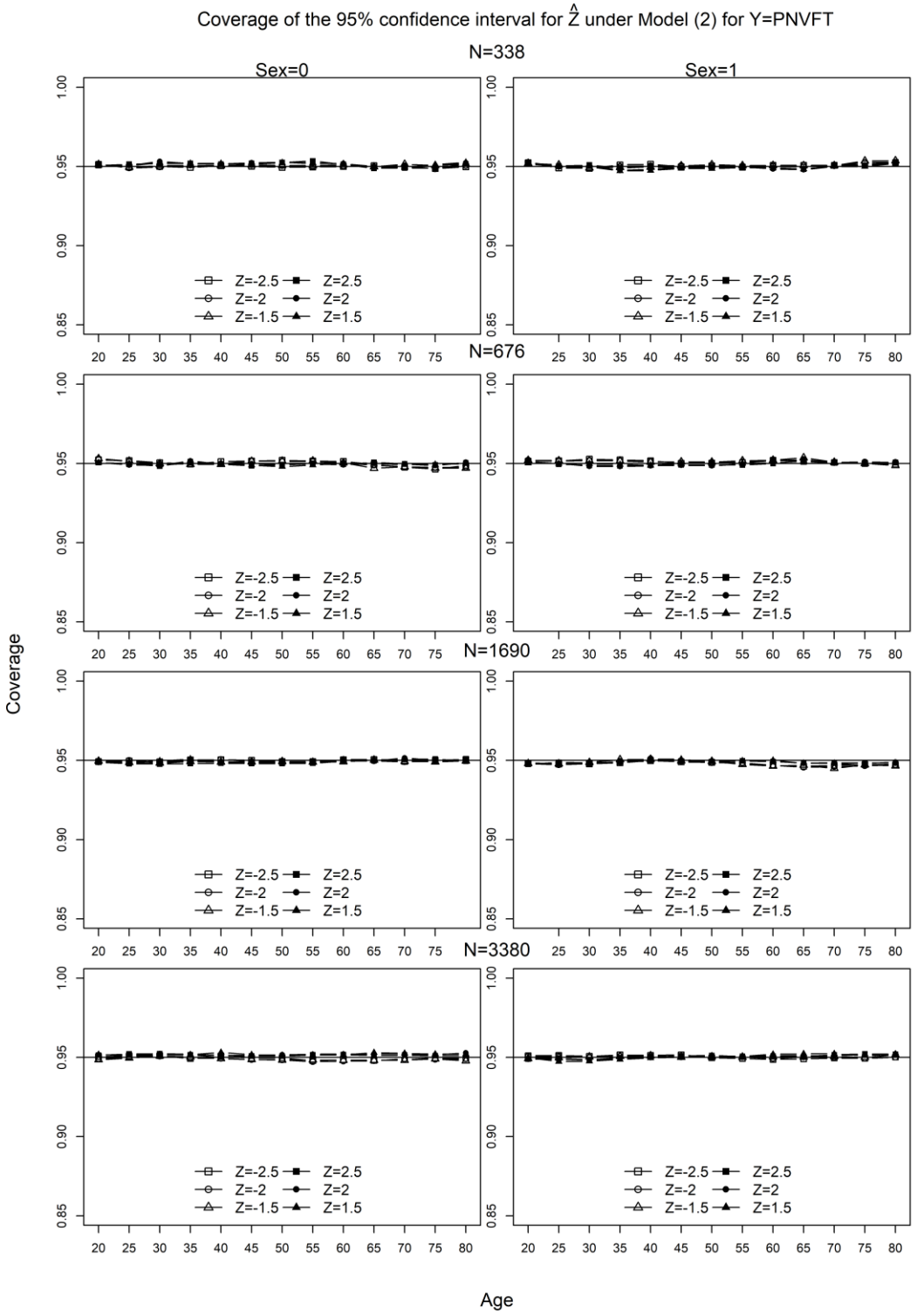

Figure S.B.1.16. Coverage of the 95% confidence interval for Z computed with equation (9), $\hat{V}(\hat{Z})$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

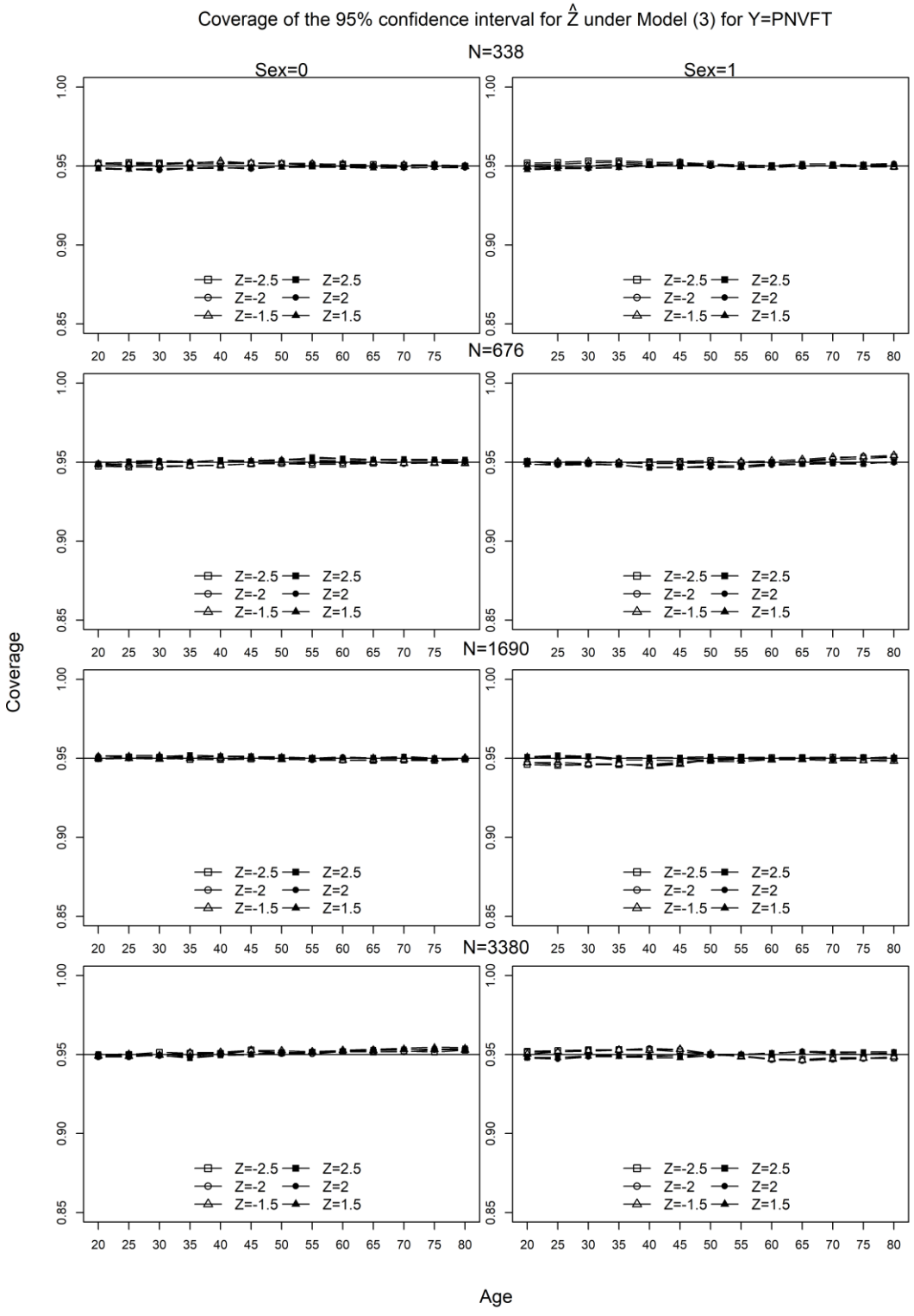

Figure S.B.1.17. Coverage of the 95% confidence interval for Z computed with equation (9), $\hat{V}(\hat{Z})$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

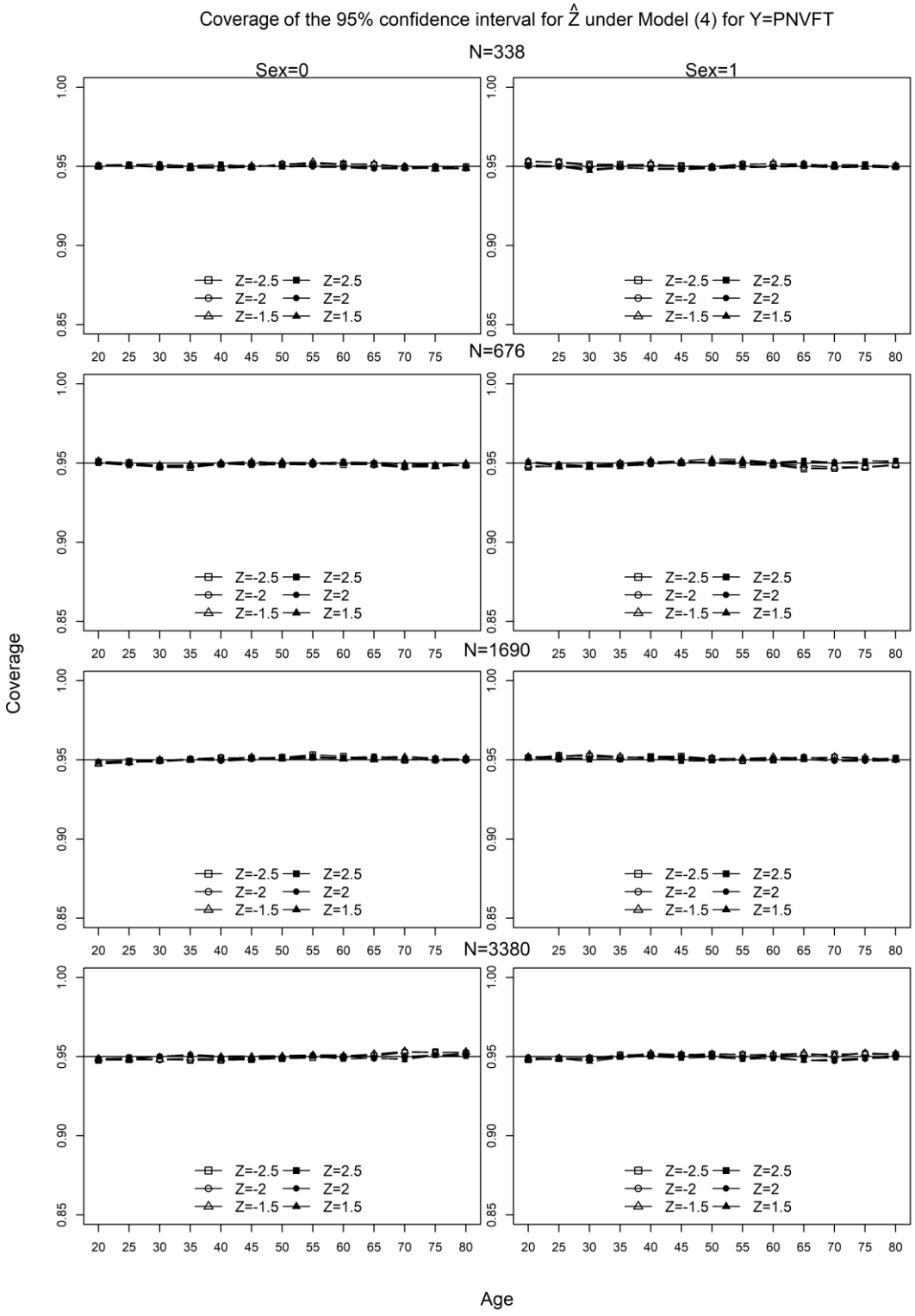

Figure S.B.1.18. Coverage of the 95% confidence interval for Z computed with equation (9), $\hat{V}(\hat{Z})$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$ (curves).

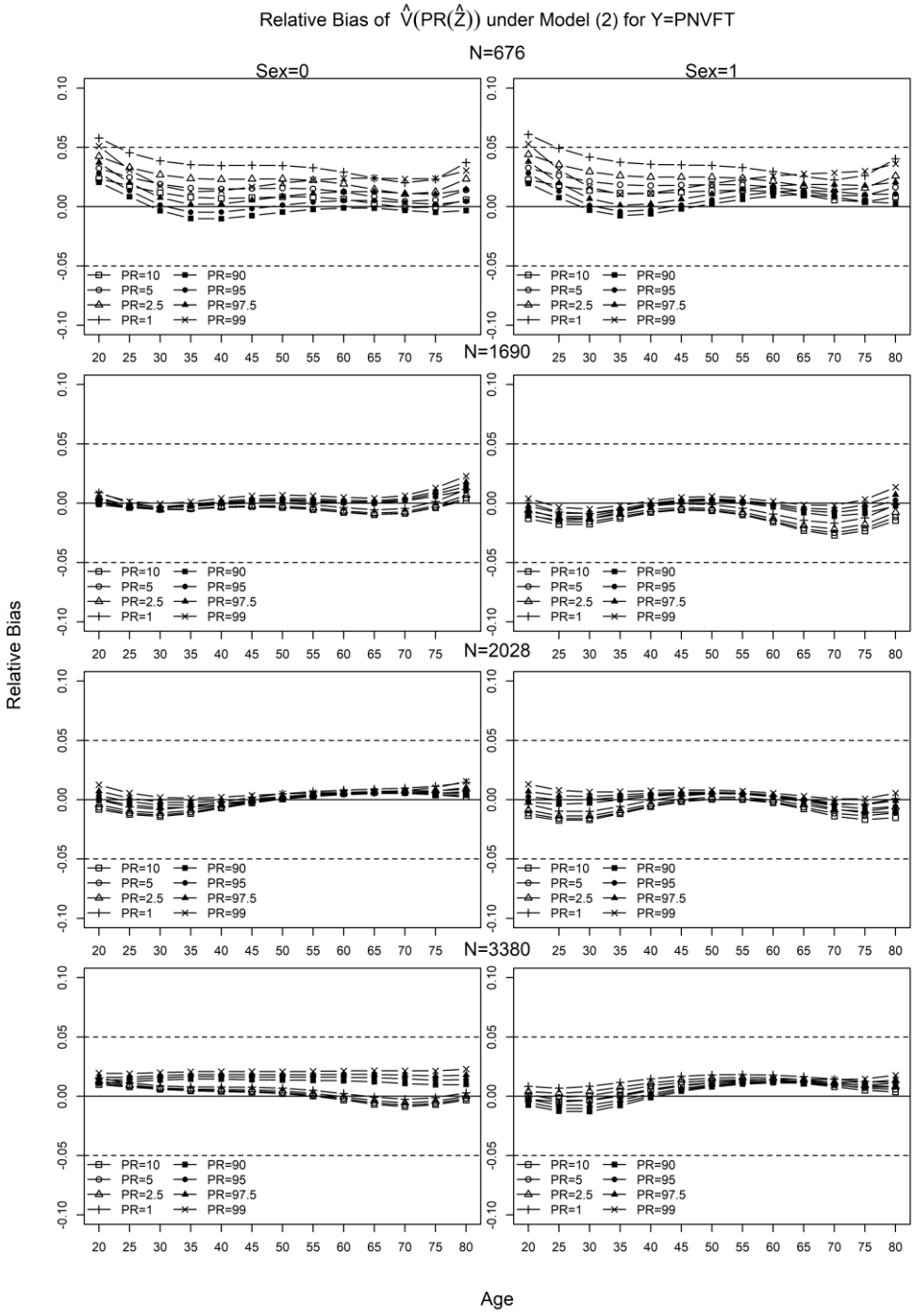

Figure S.B.1.19. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

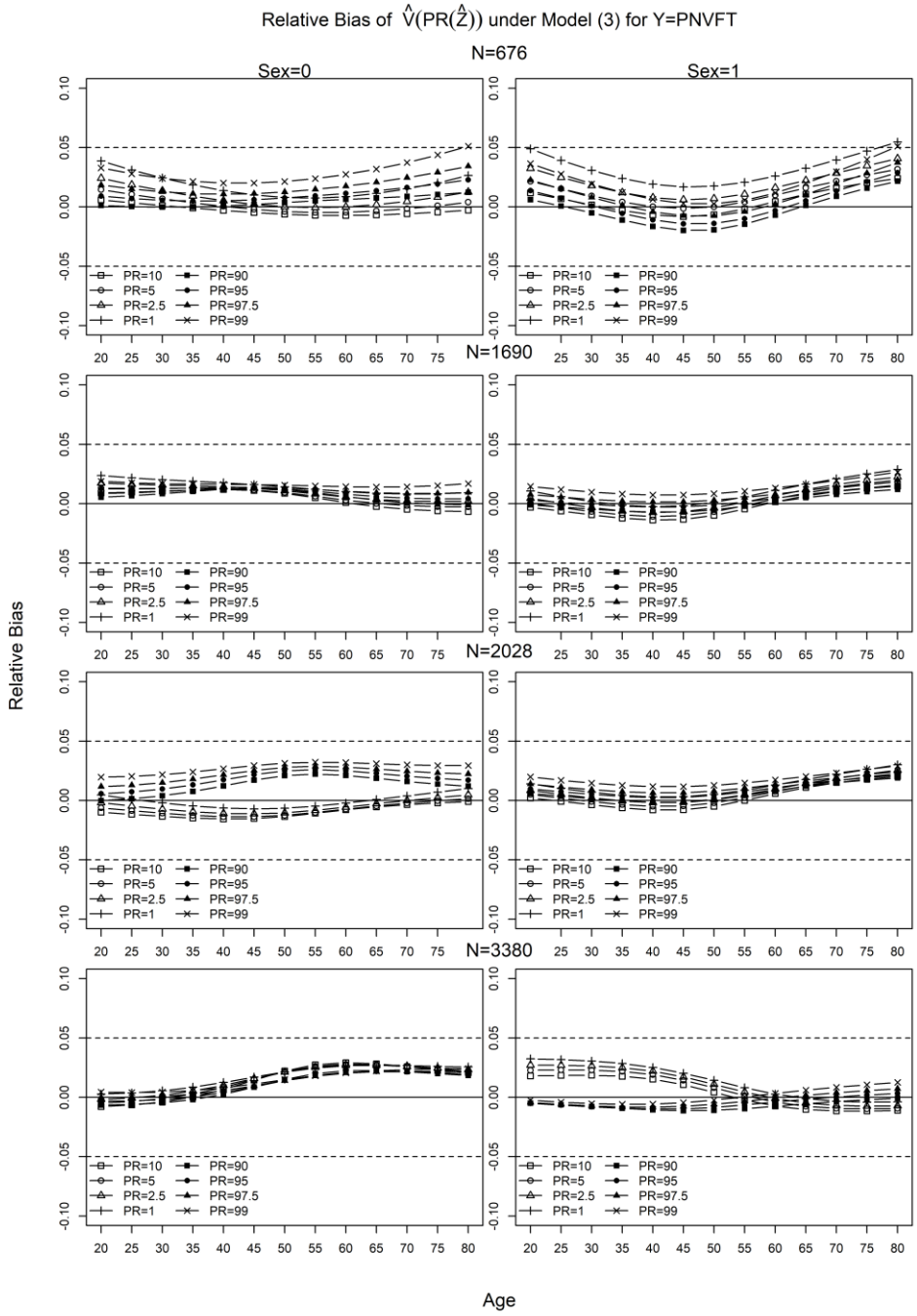

Figure S.B.1.20. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

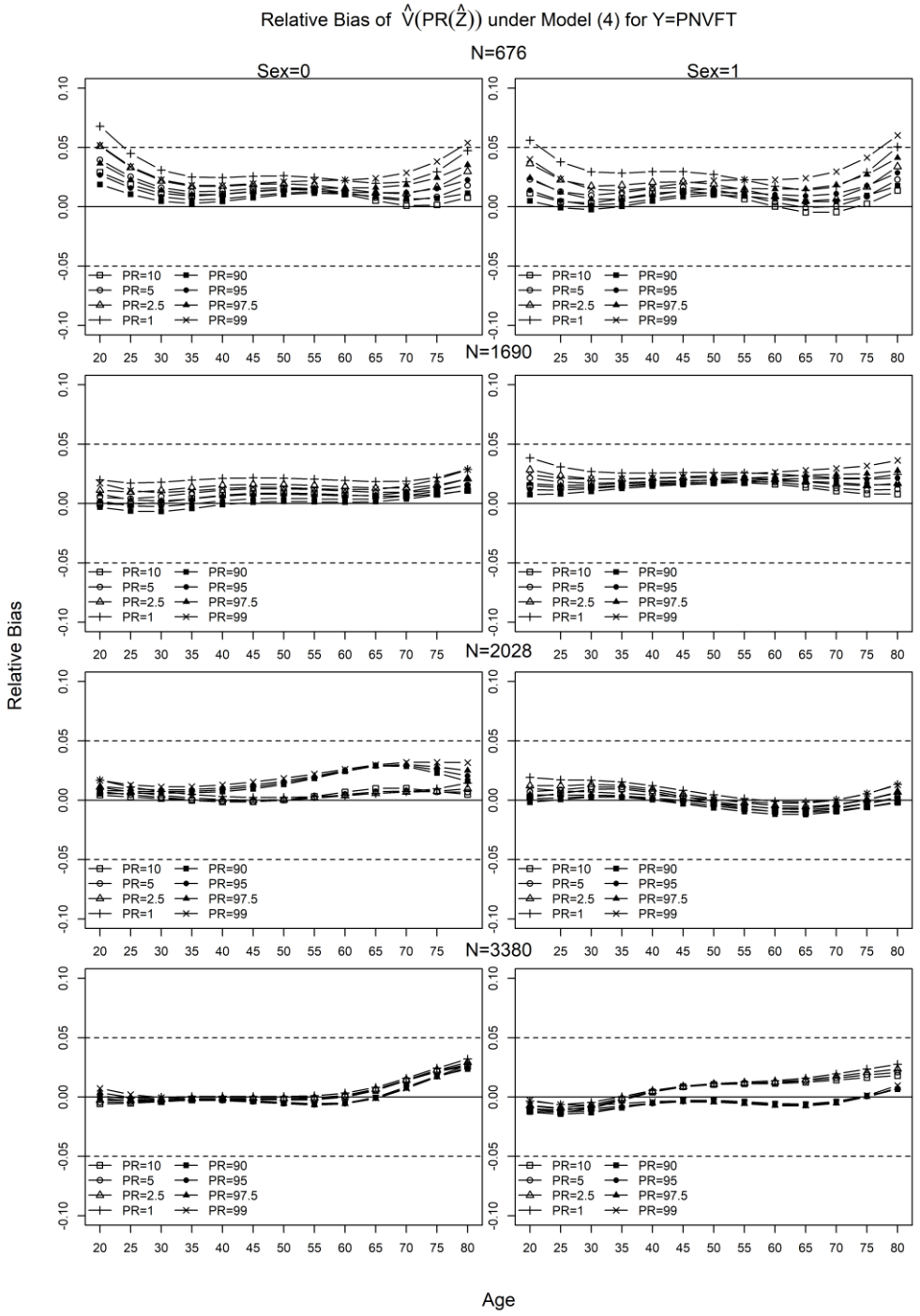

Figure S.B.1.21. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

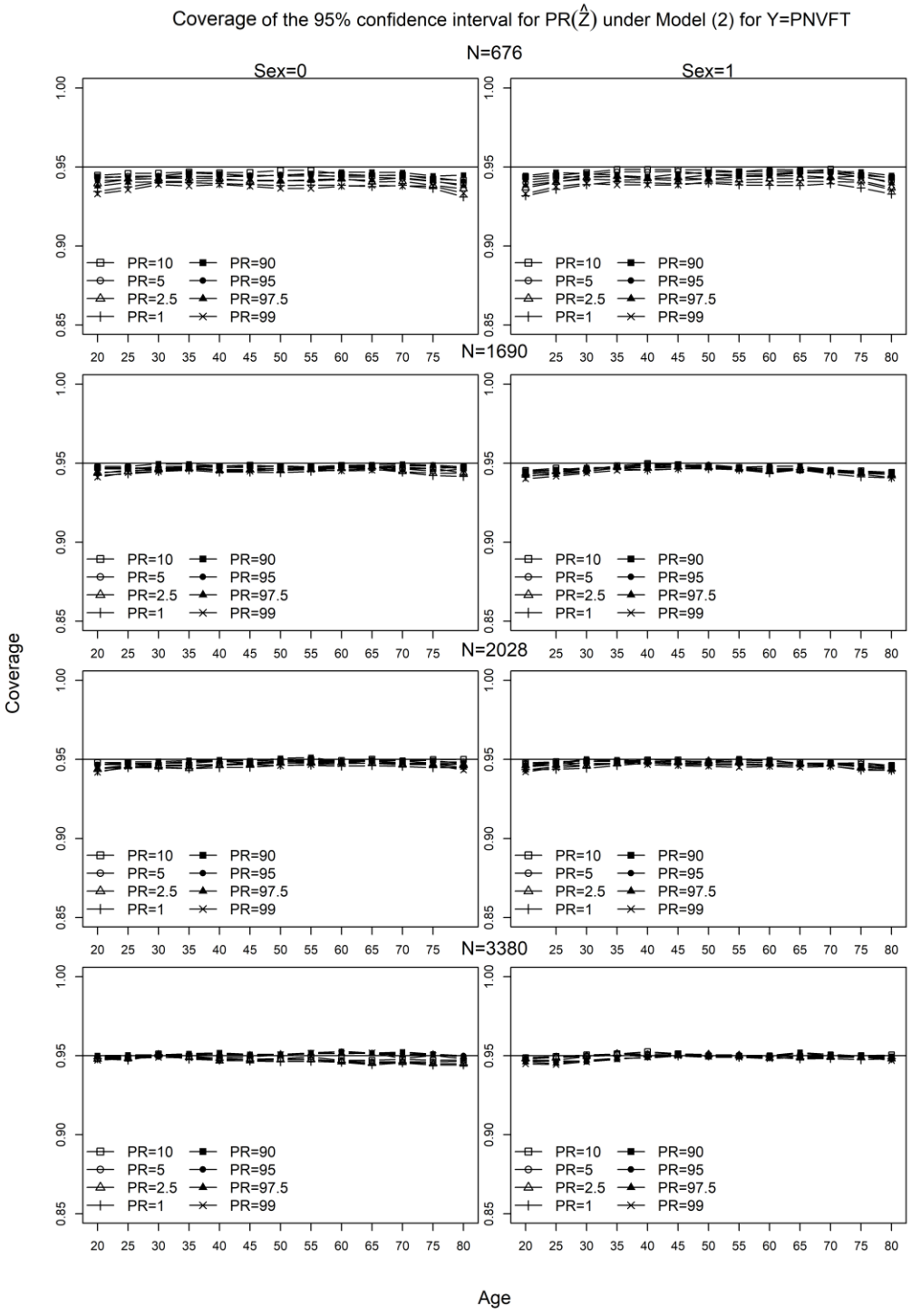

Figure S.B.1.22. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves).

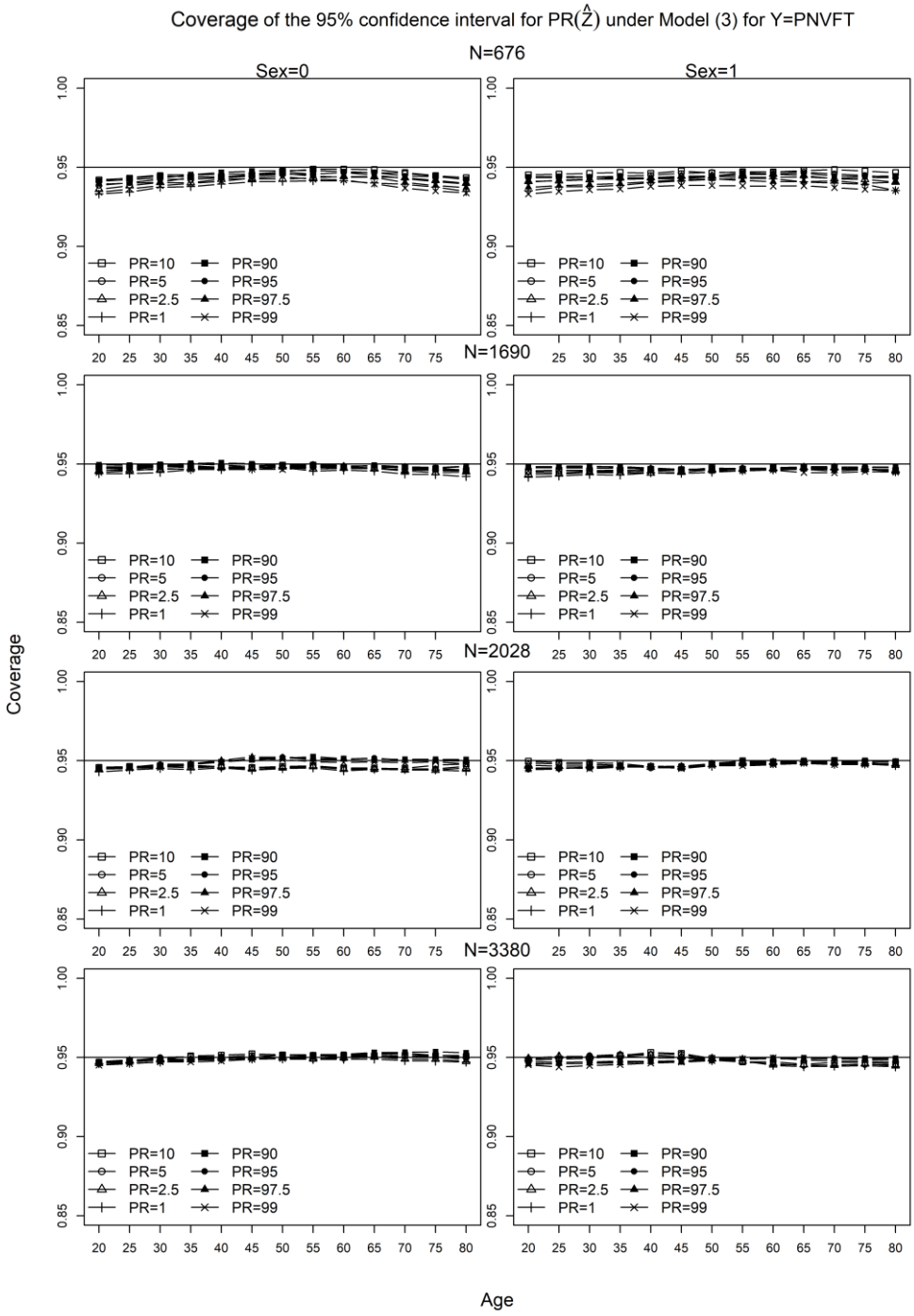

Figure S.B.1.23. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (3) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves).

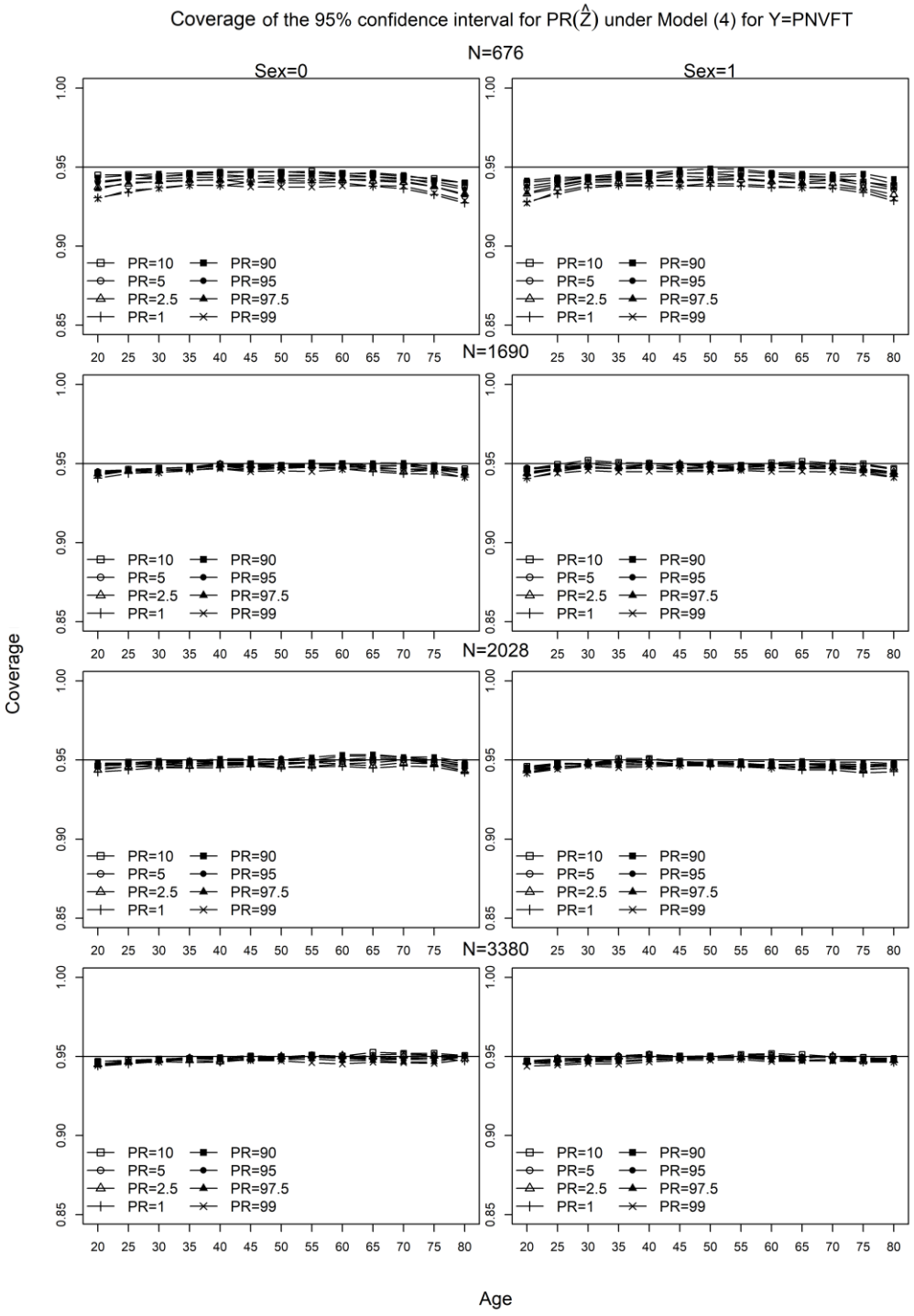

Figure S.B.1.24. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{1,2.5,5,10,90,95,97.5,99\}$ (curves).

Results for PR-scores corresponding to $Z \in \{\pm 1.5, \pm 2, \pm 2.5\}$

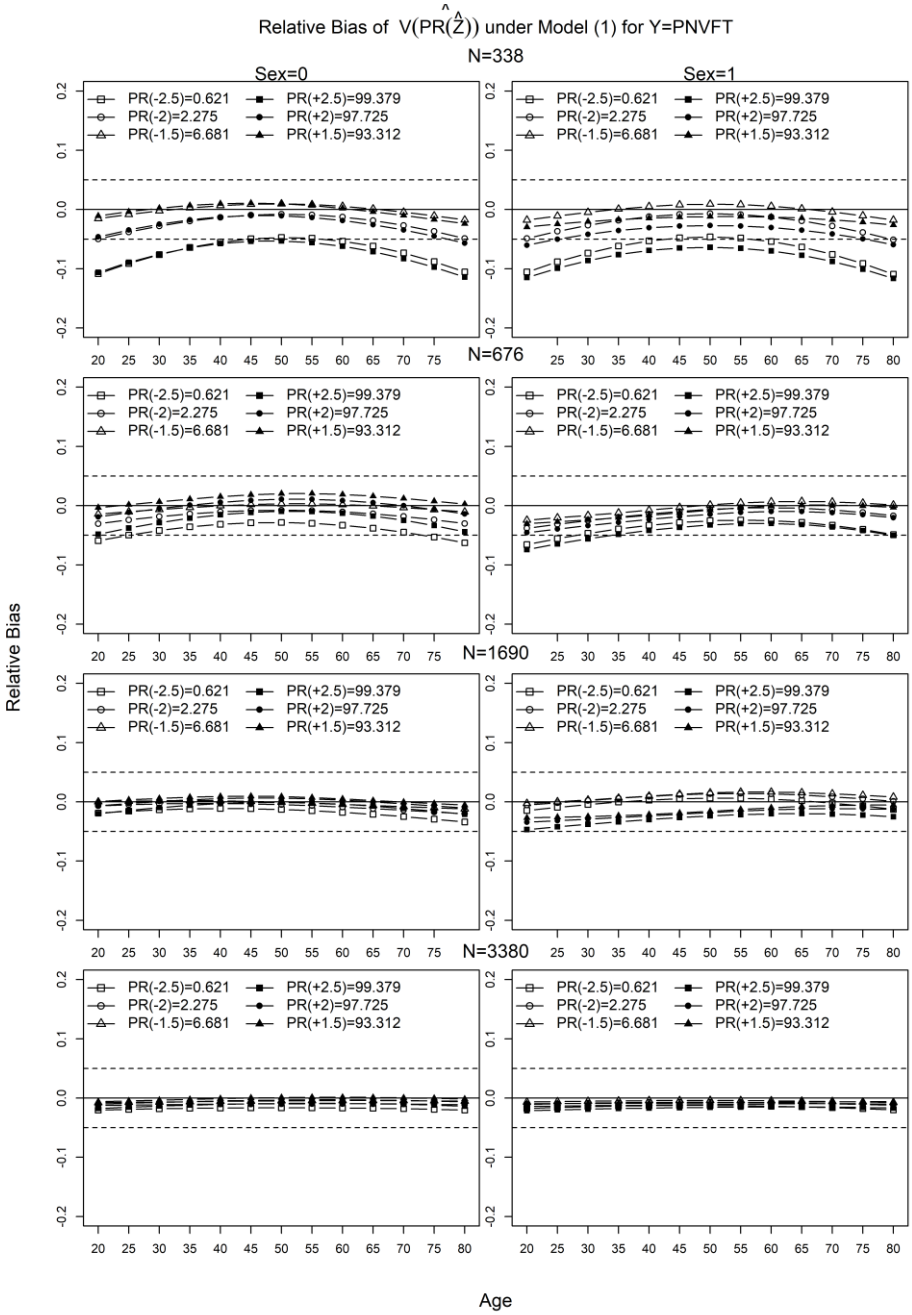

Figure S.B.1.25. Relative bias of equation (8), $V\left(PR\left(\hat{Z}\right)\right)$, under model (1) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

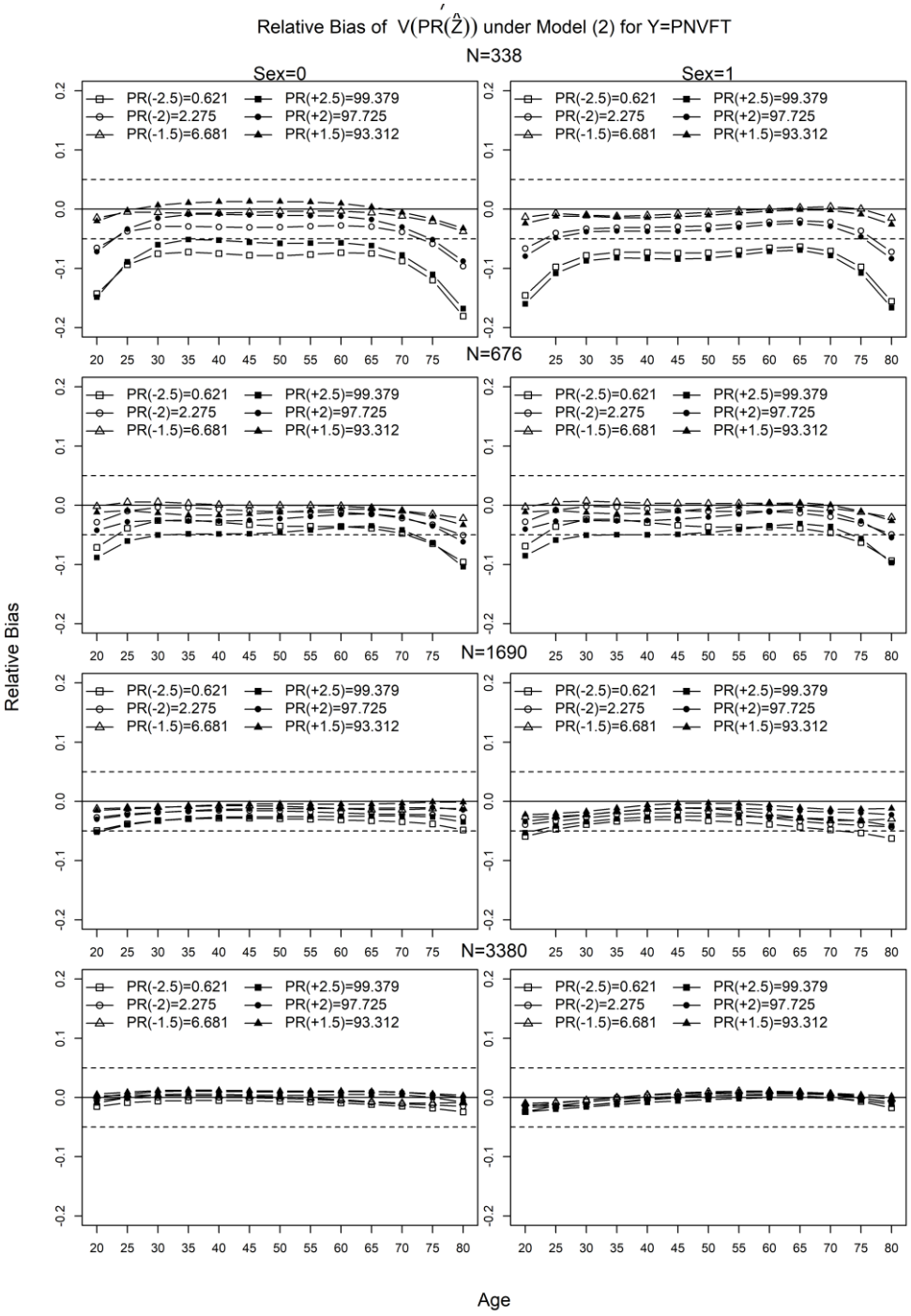

Figure S.B.1.26. Relative bias of equation (8), $V\left(PR\left(\hat{Z}\right)\right)$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

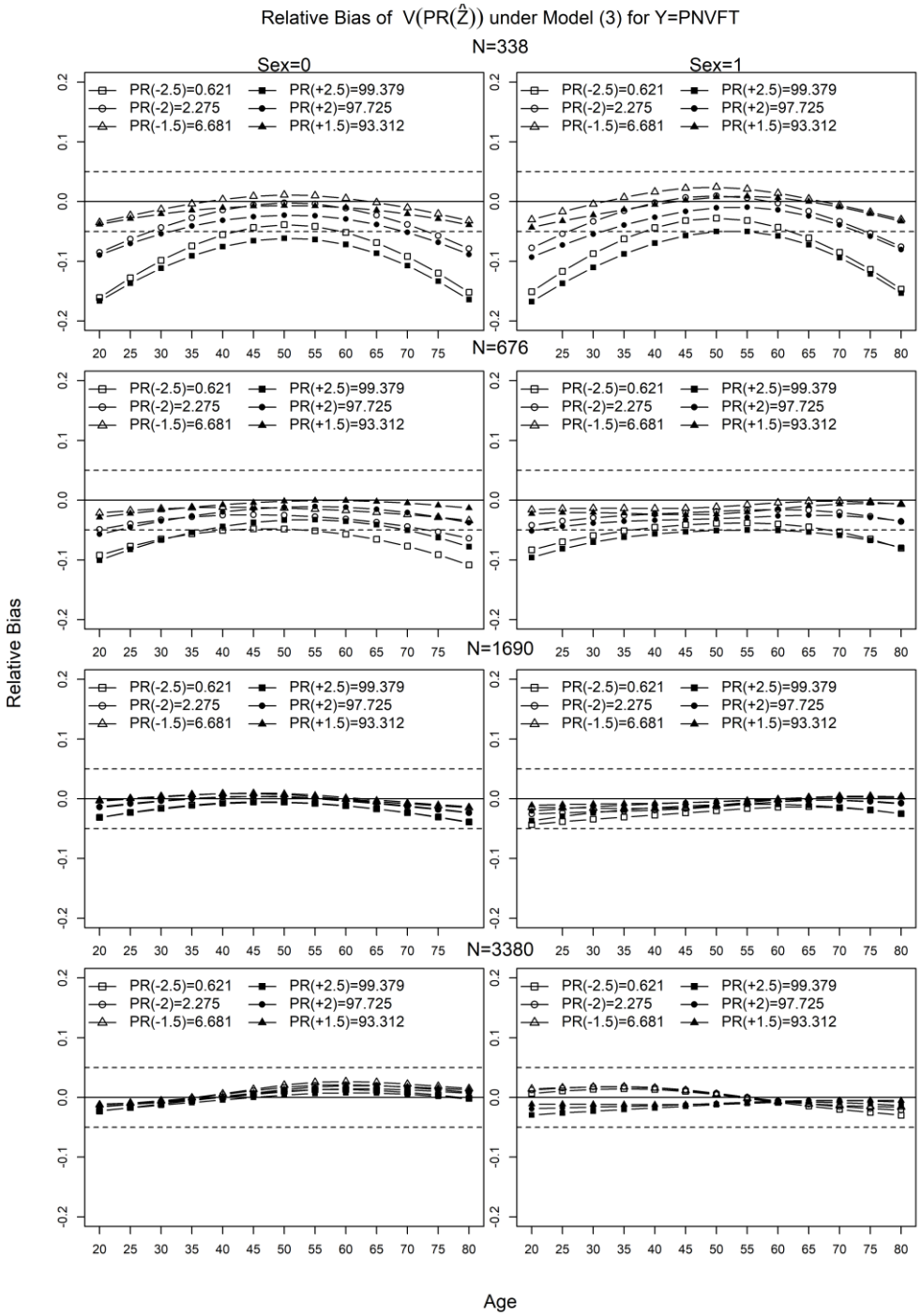

Figure S.B.1.27. Relative bias of equation (8), $V\left(PR\left(\hat{Z}\right)\right)$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

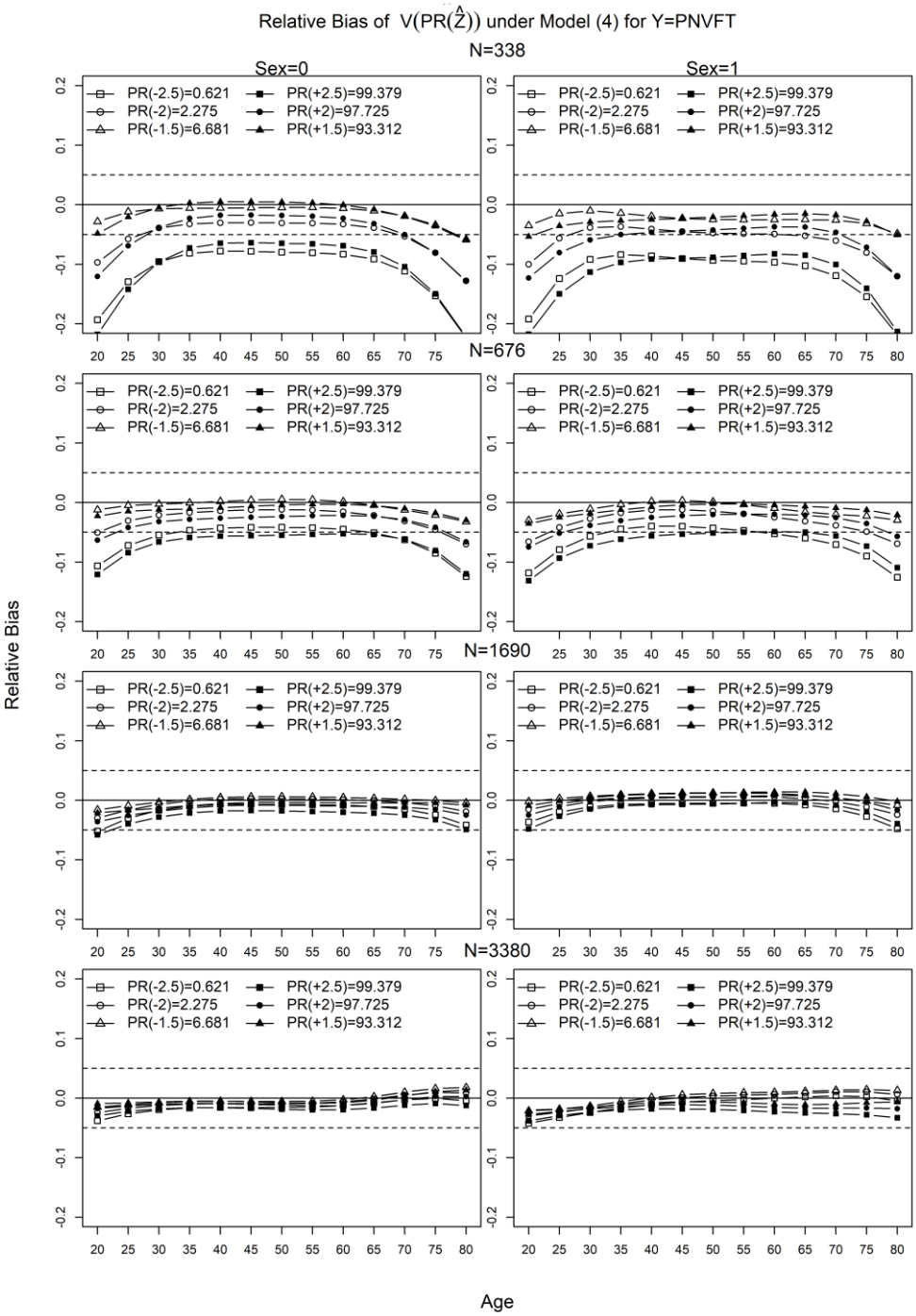

Figure S.B.1.28. Relative bias of equation (8), $V\left(PR\left(\hat{Z}\right)\right)$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

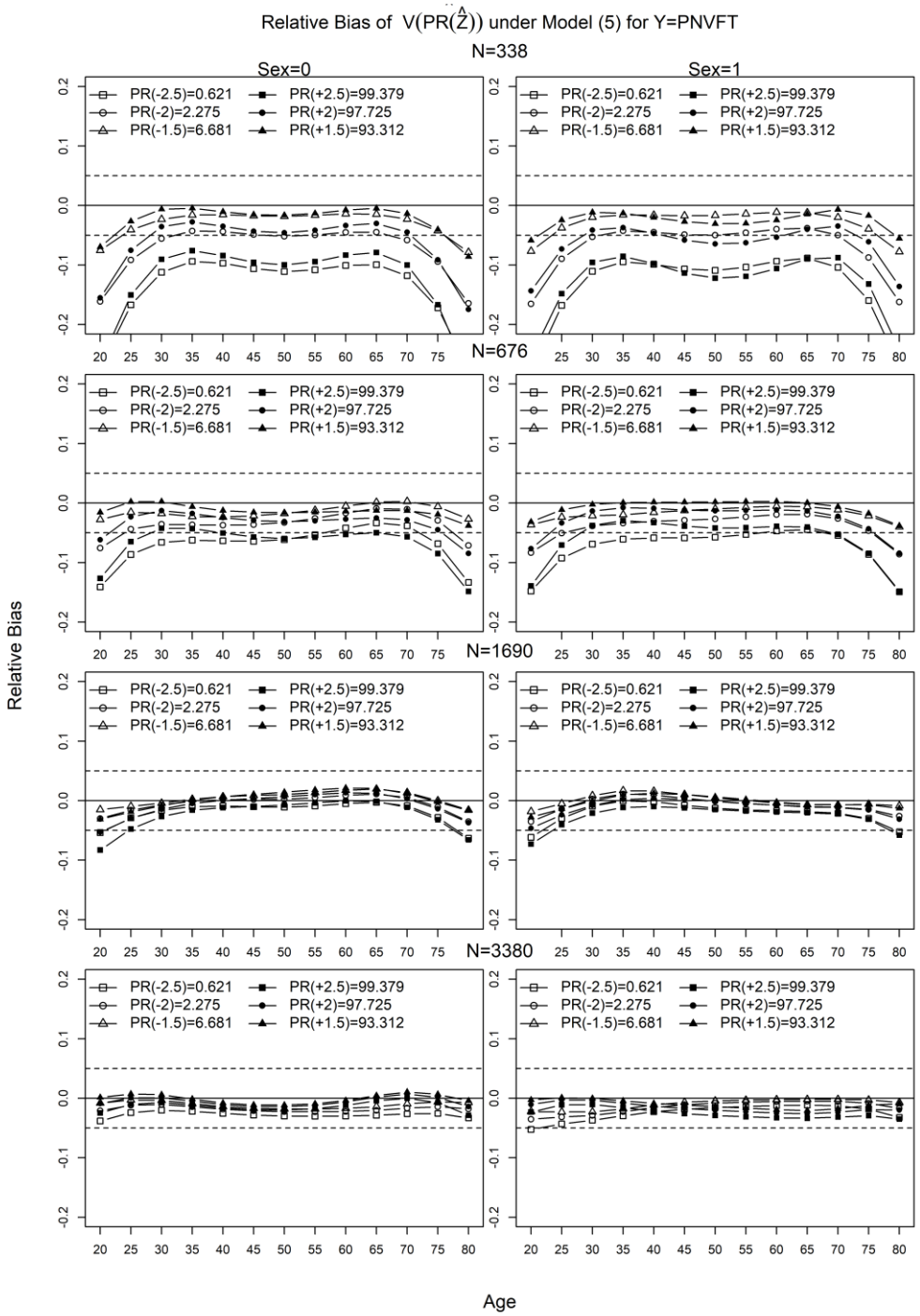

Figure S.B.1.29. Relative bias of equation (8), $V\left(PR\left(\hat{Z}\right)\right)$, under model (5) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

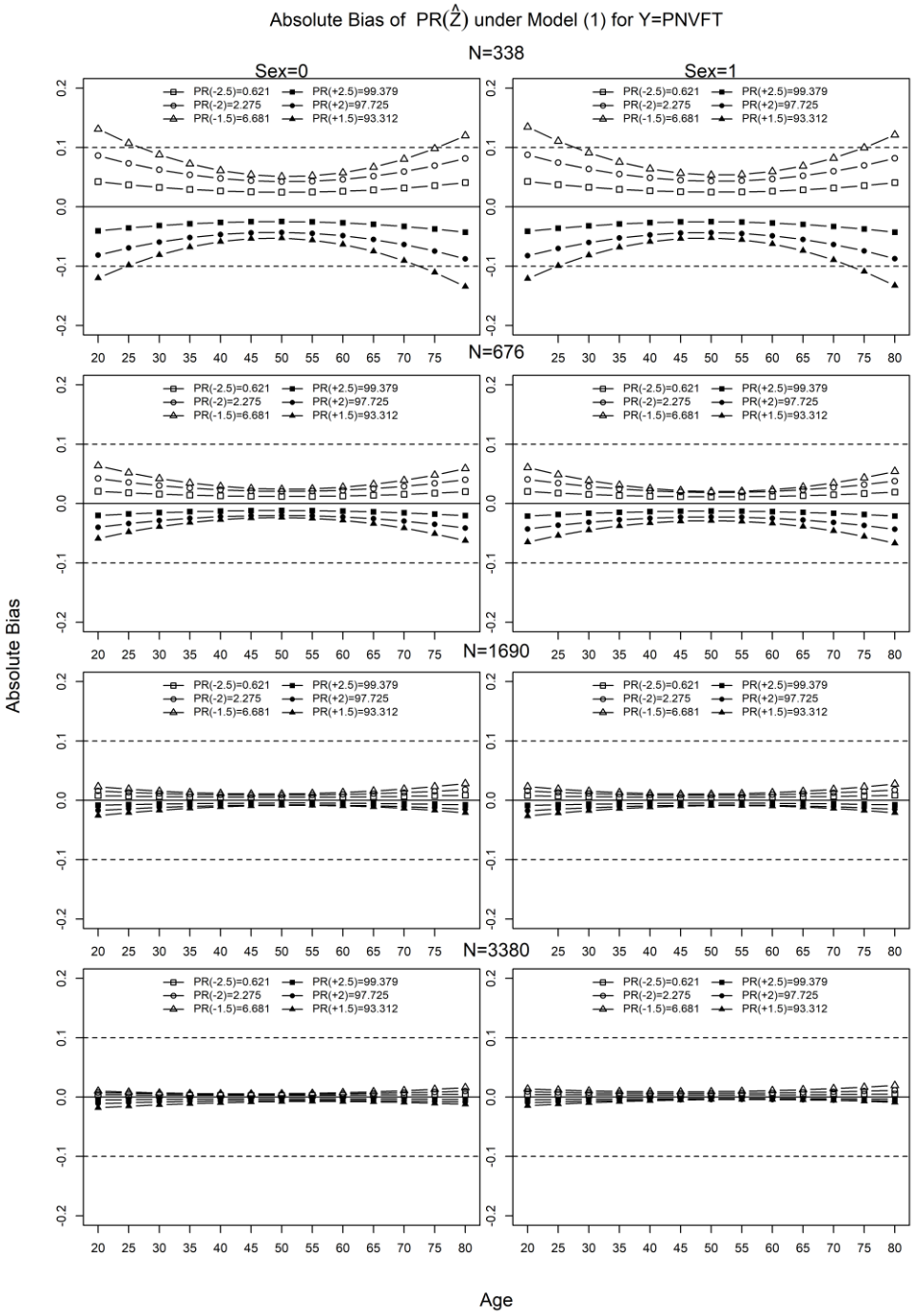

Figure S.B.1.30. Absolute bias of equation (6), $PR(\hat{Z})$, under model (1) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

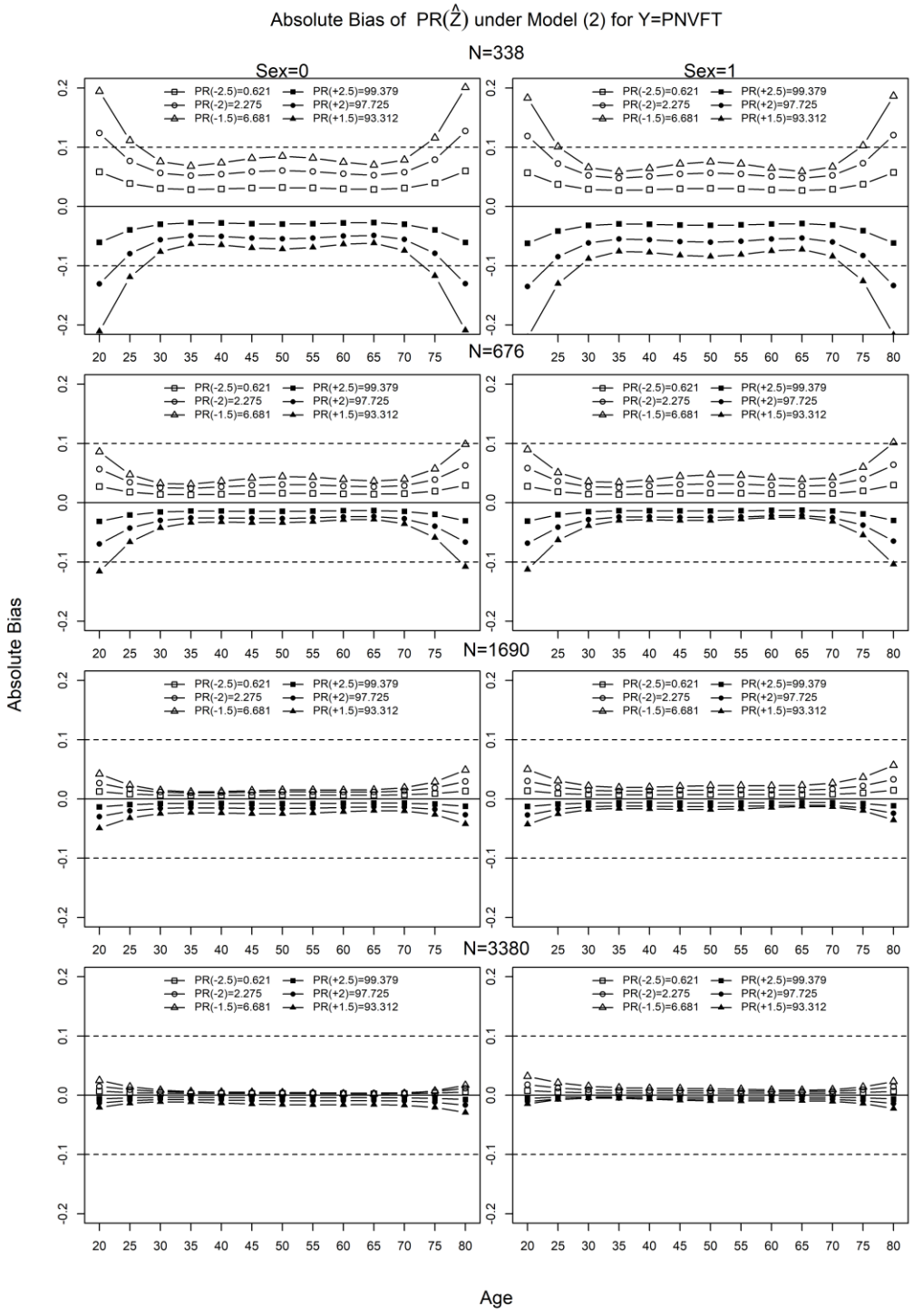

Figure S.B.1.31. Absolute bias of equation (6), $PR(\hat{Z})$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

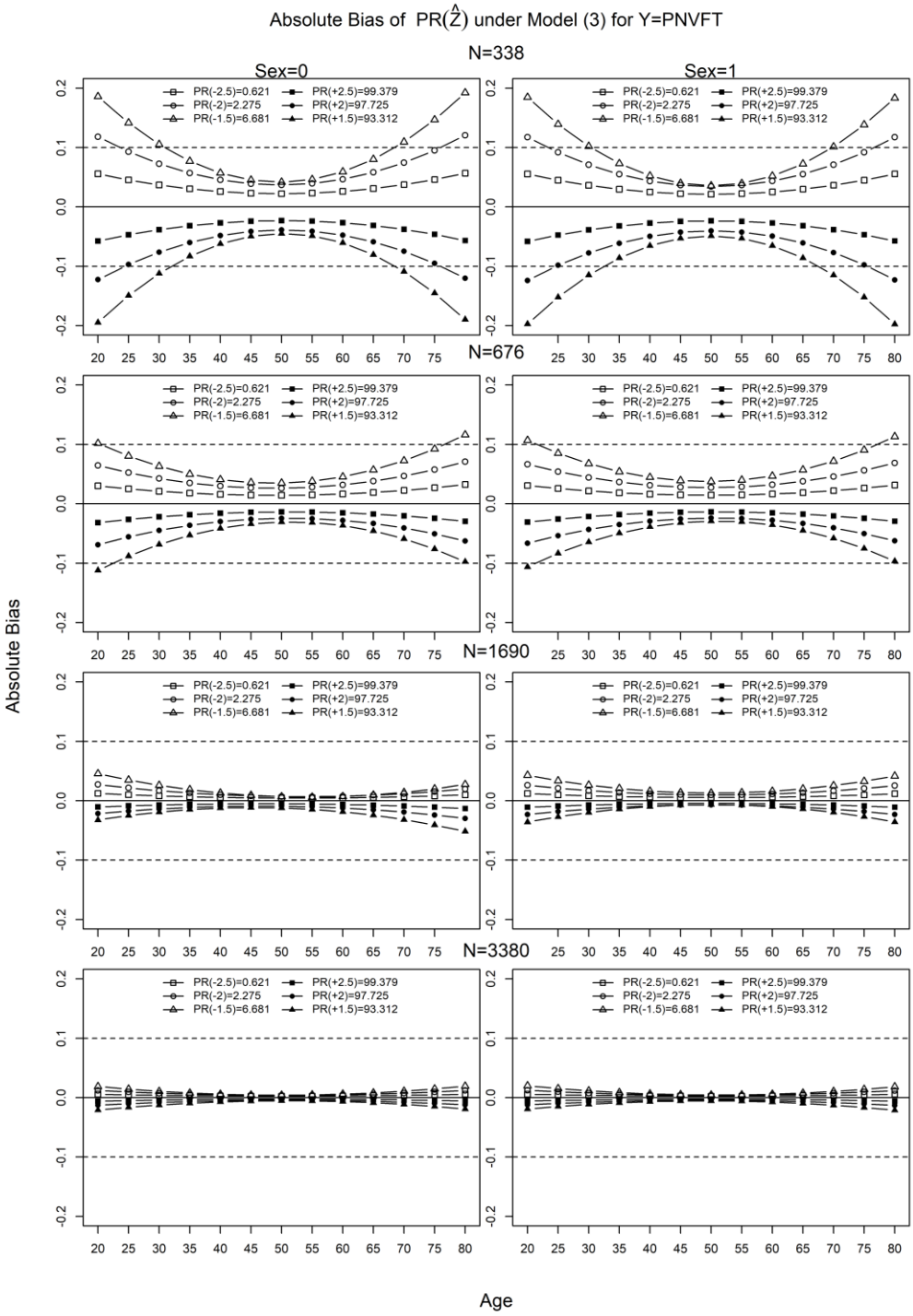

Figure S.B.1.32. Absolute bias of equation (6), $PR(\hat{Z})$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

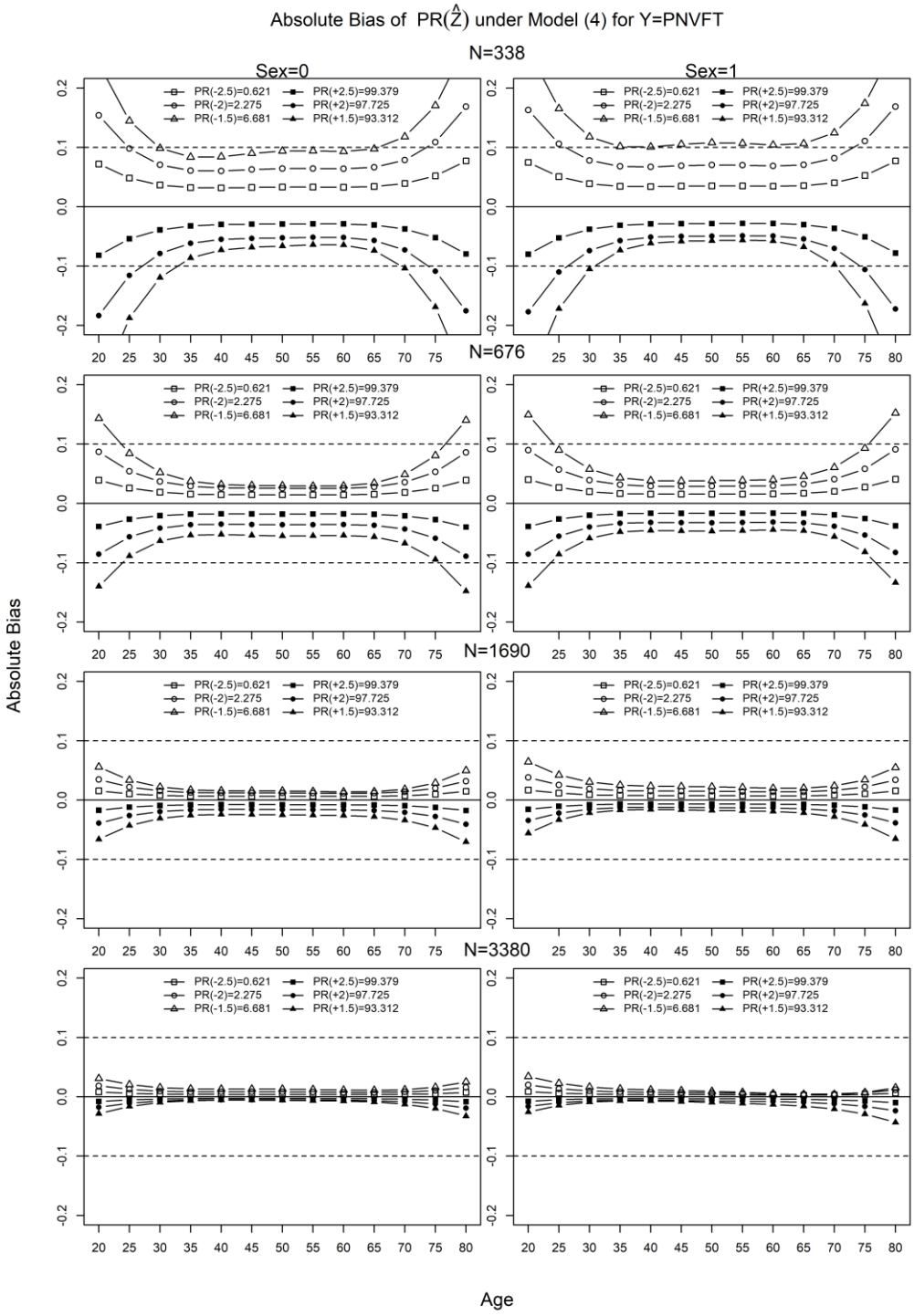

Figure S.B.1.33. Absolute bias of equation (6), $PR(\hat{Z})$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

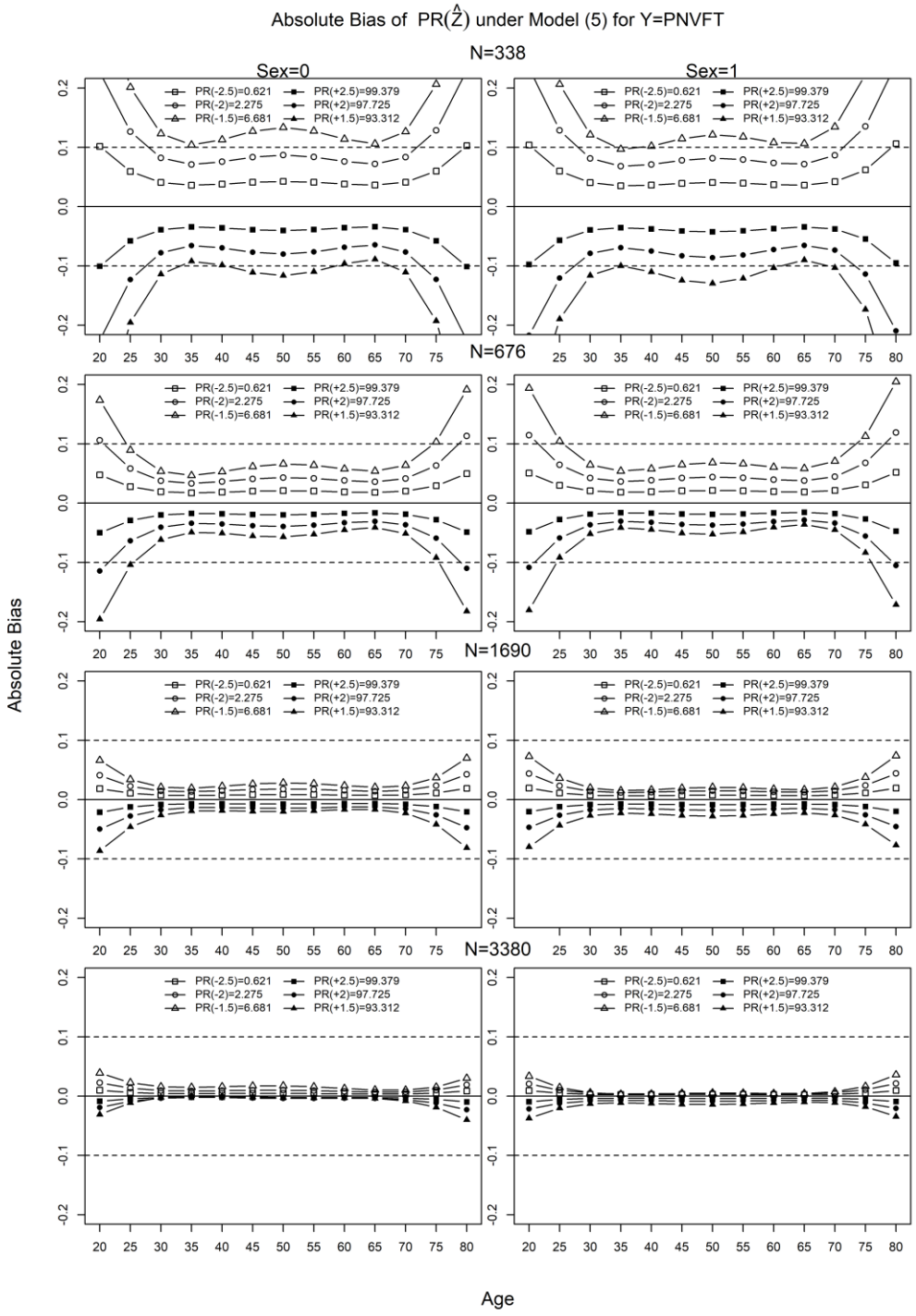

Figure S.B.1.34. Absolute bias of equation (6), $PR(\hat{Z})$, under model (5) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The absolute bias can be considered as acceptable within the range $[-0.1,0.1]$ on the scale from 0 to 100 (horizontal dotted lines).

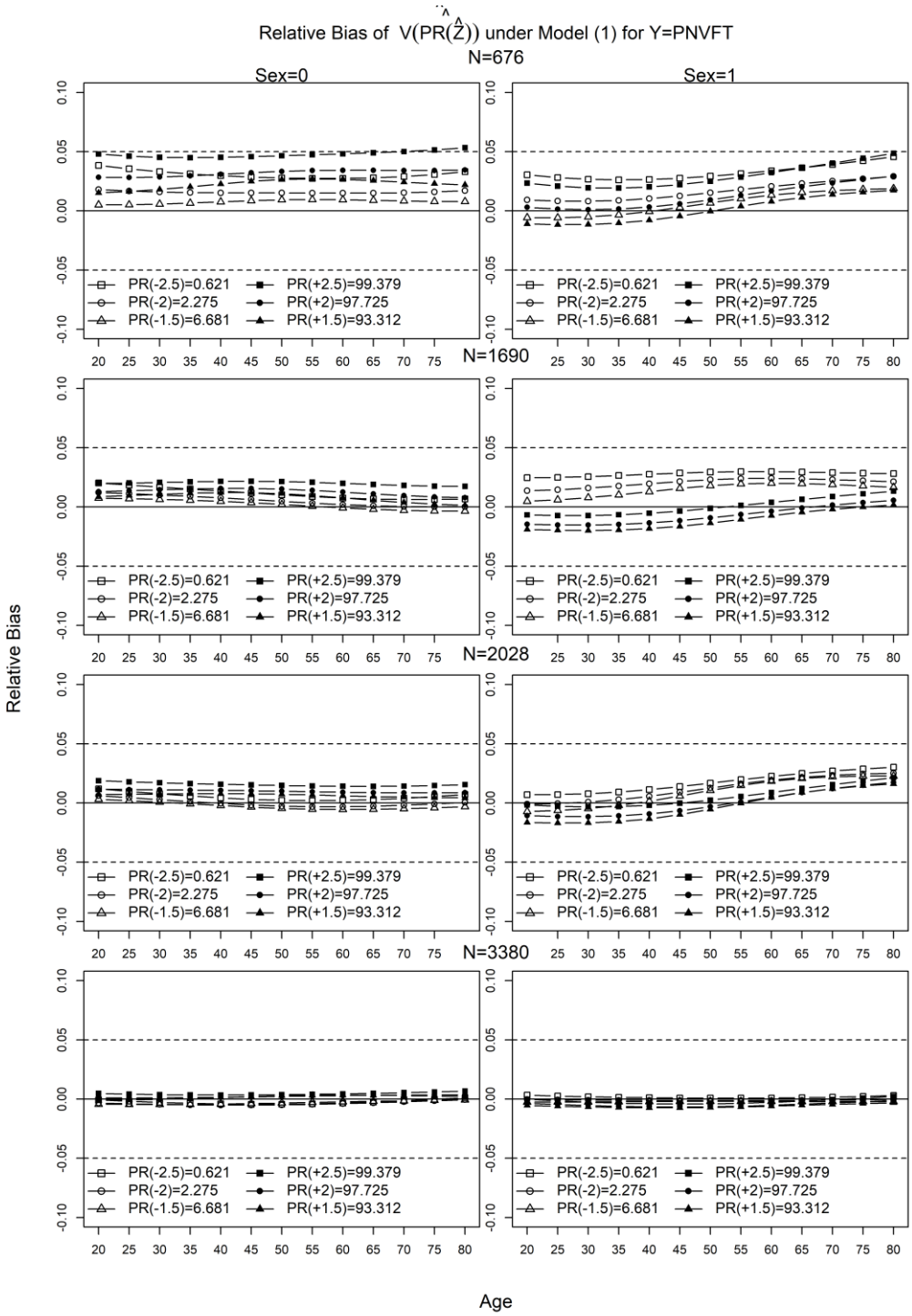

Figure S.B.1.35. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (1) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

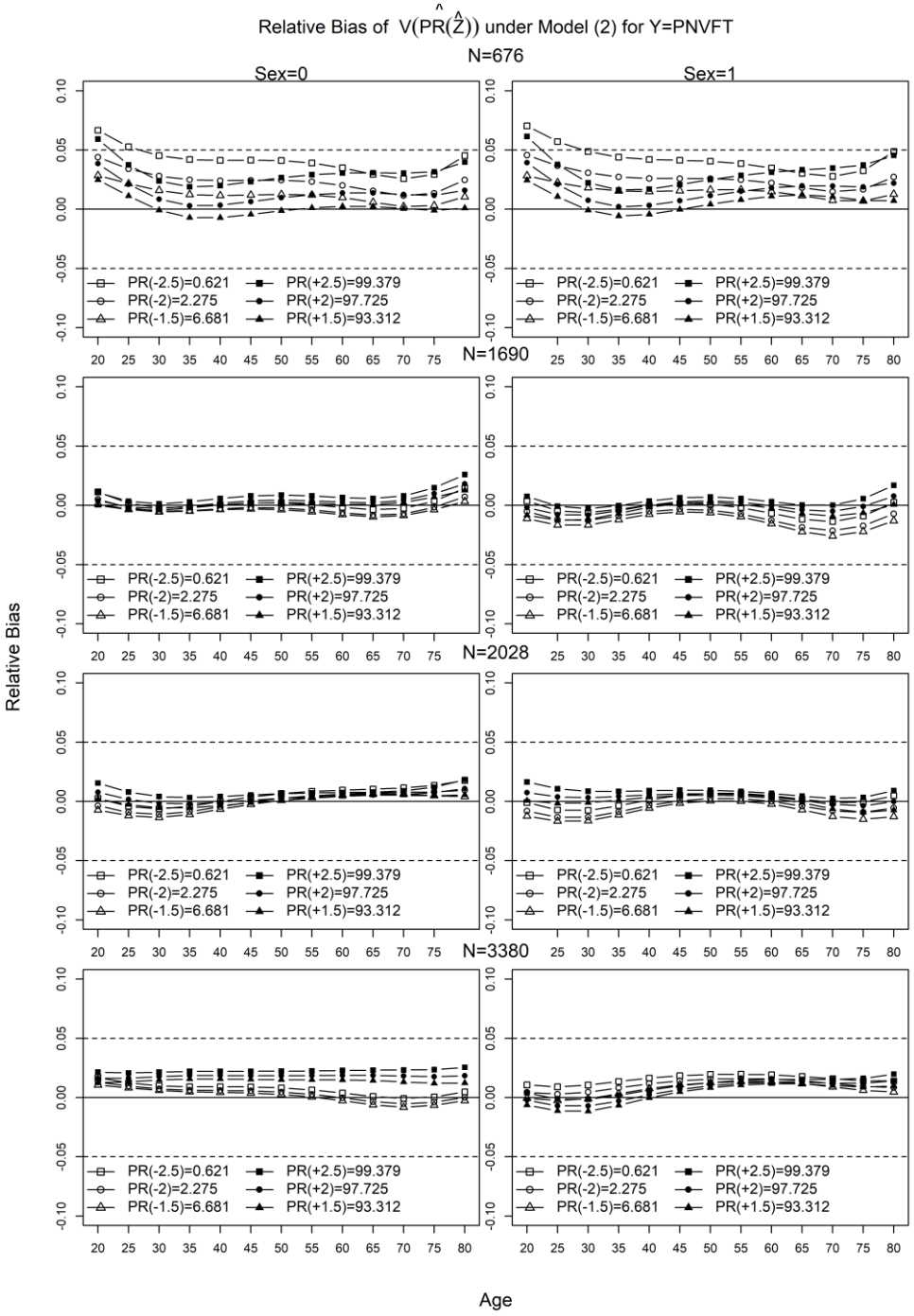

Figure S.B.1.36. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

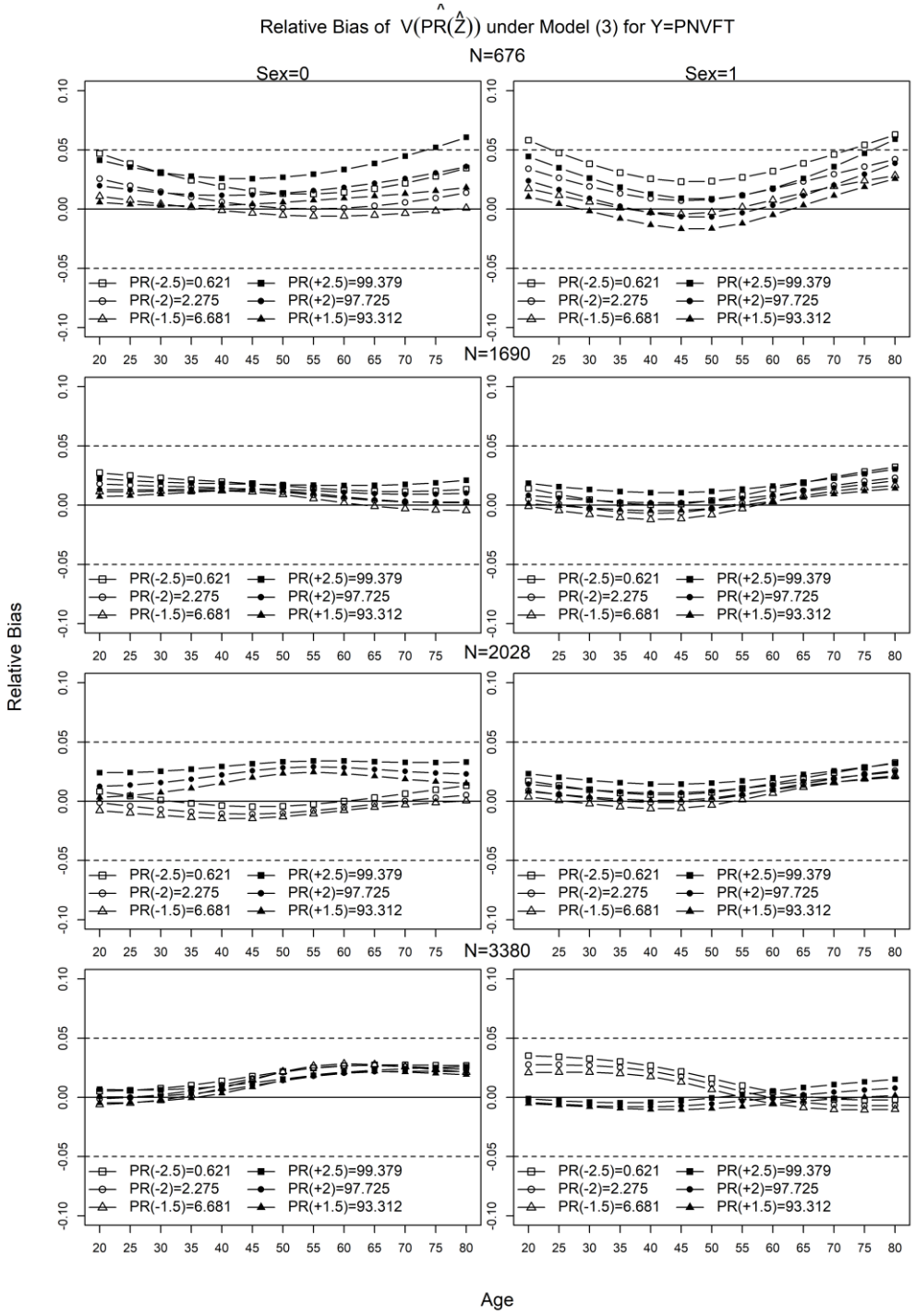

Figure S.B.1.37. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

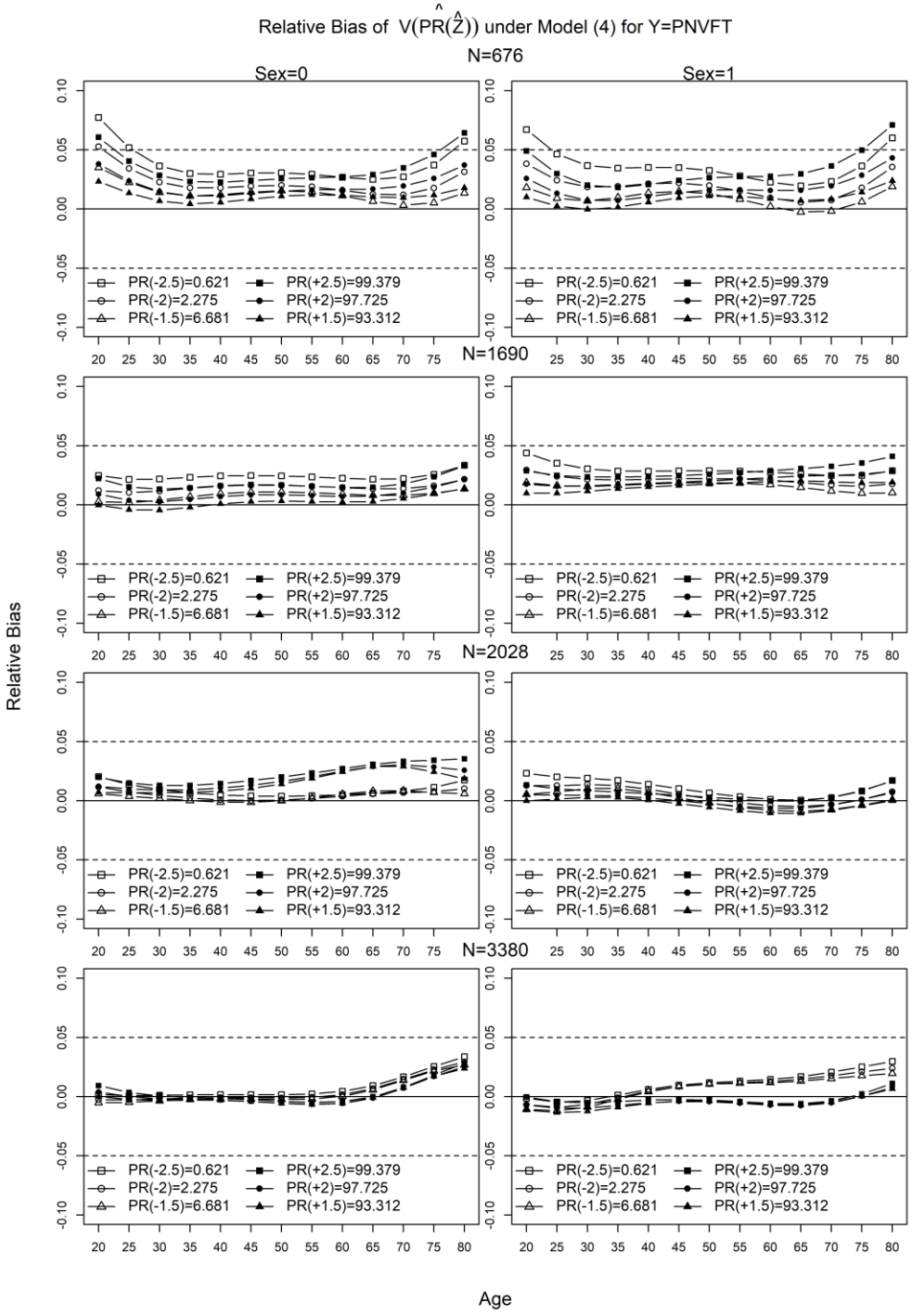

Figure S.B.1.38. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (4) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

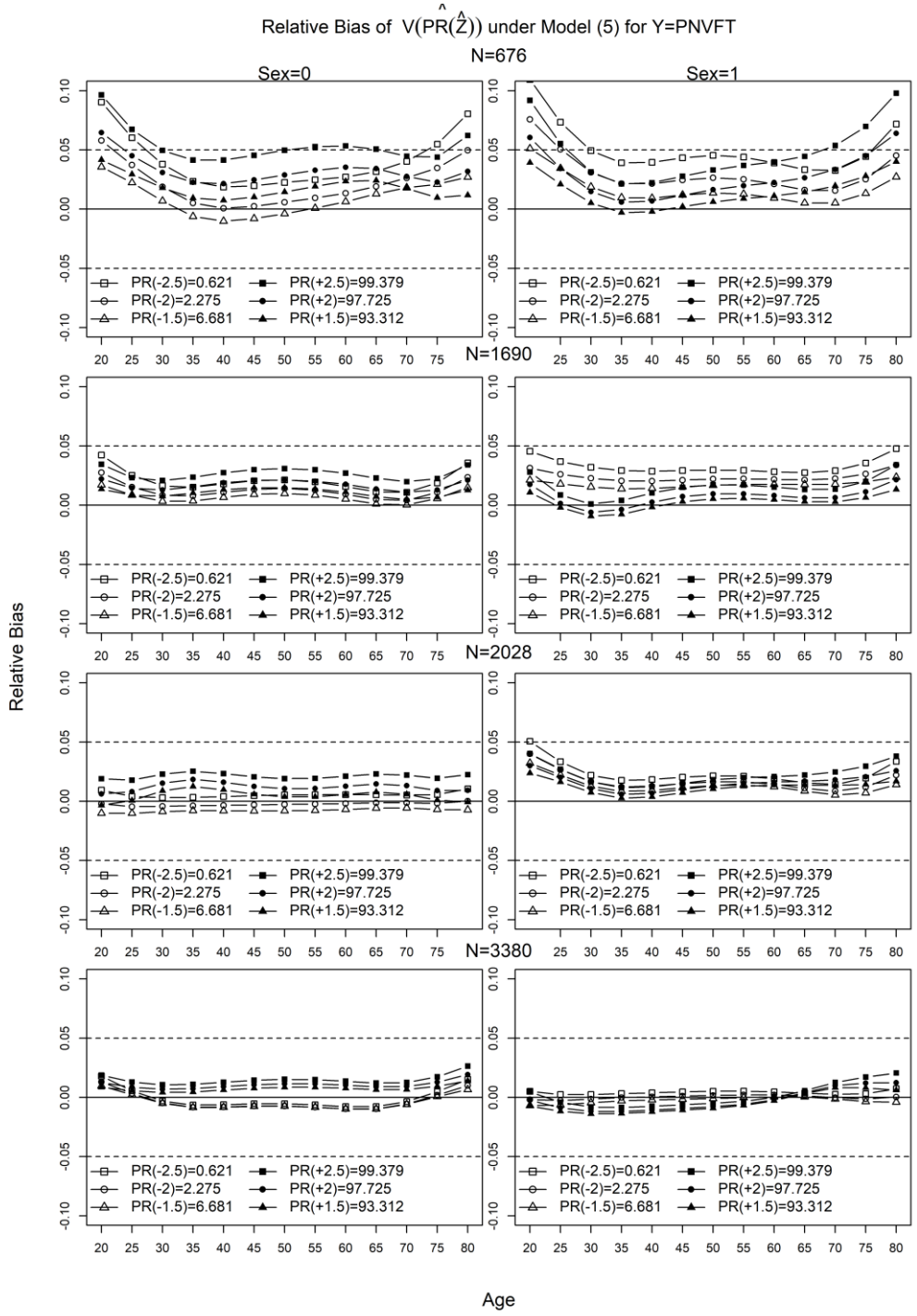

Figure S.B.1.39. Relative bias of equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (5) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{338,676,1690,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves). The relative bias can be considered as acceptable within the range $[-5\%, 5\%]$ (horizontal dotted lines).

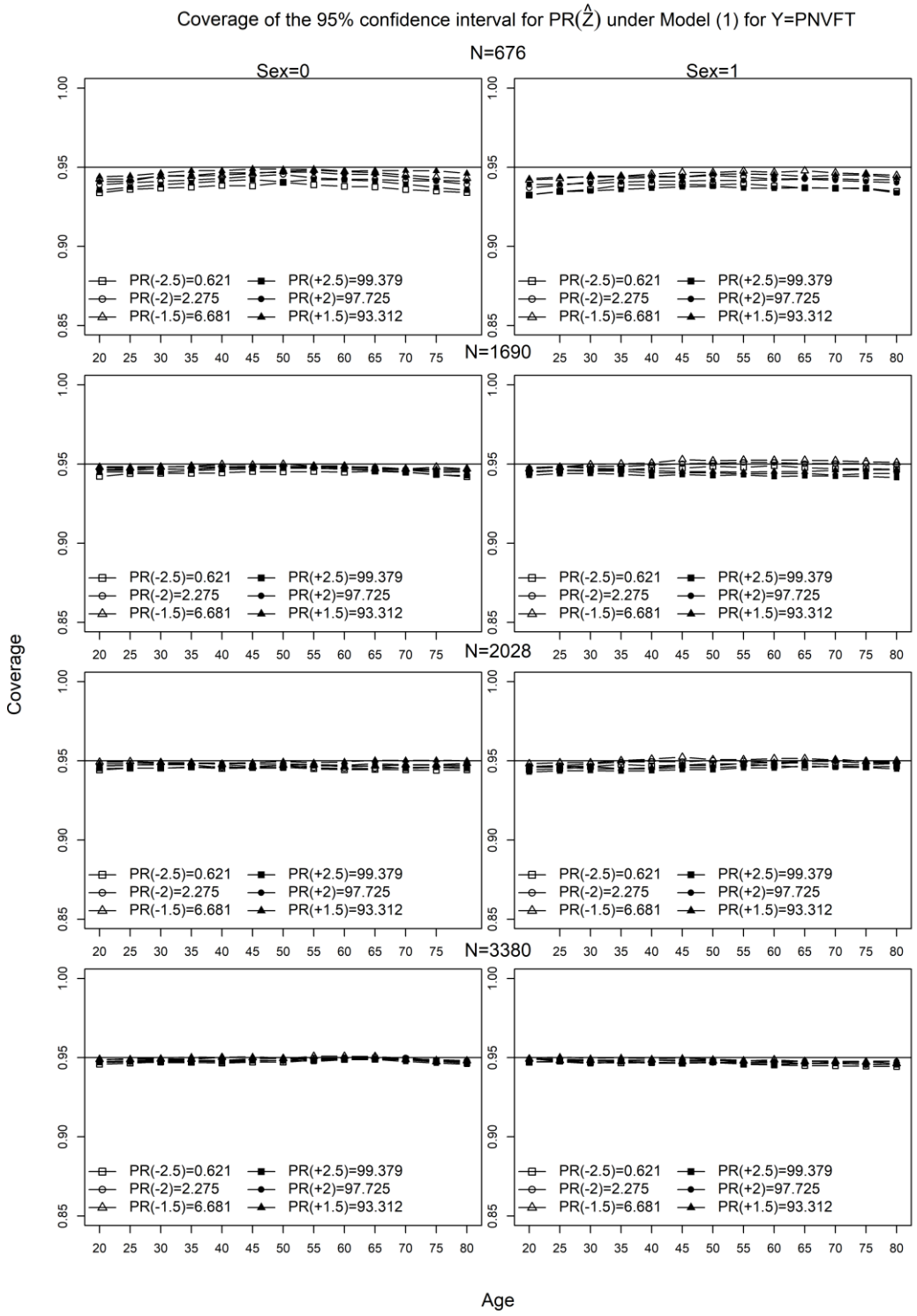

Figure S.B.1.40. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (1) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves).

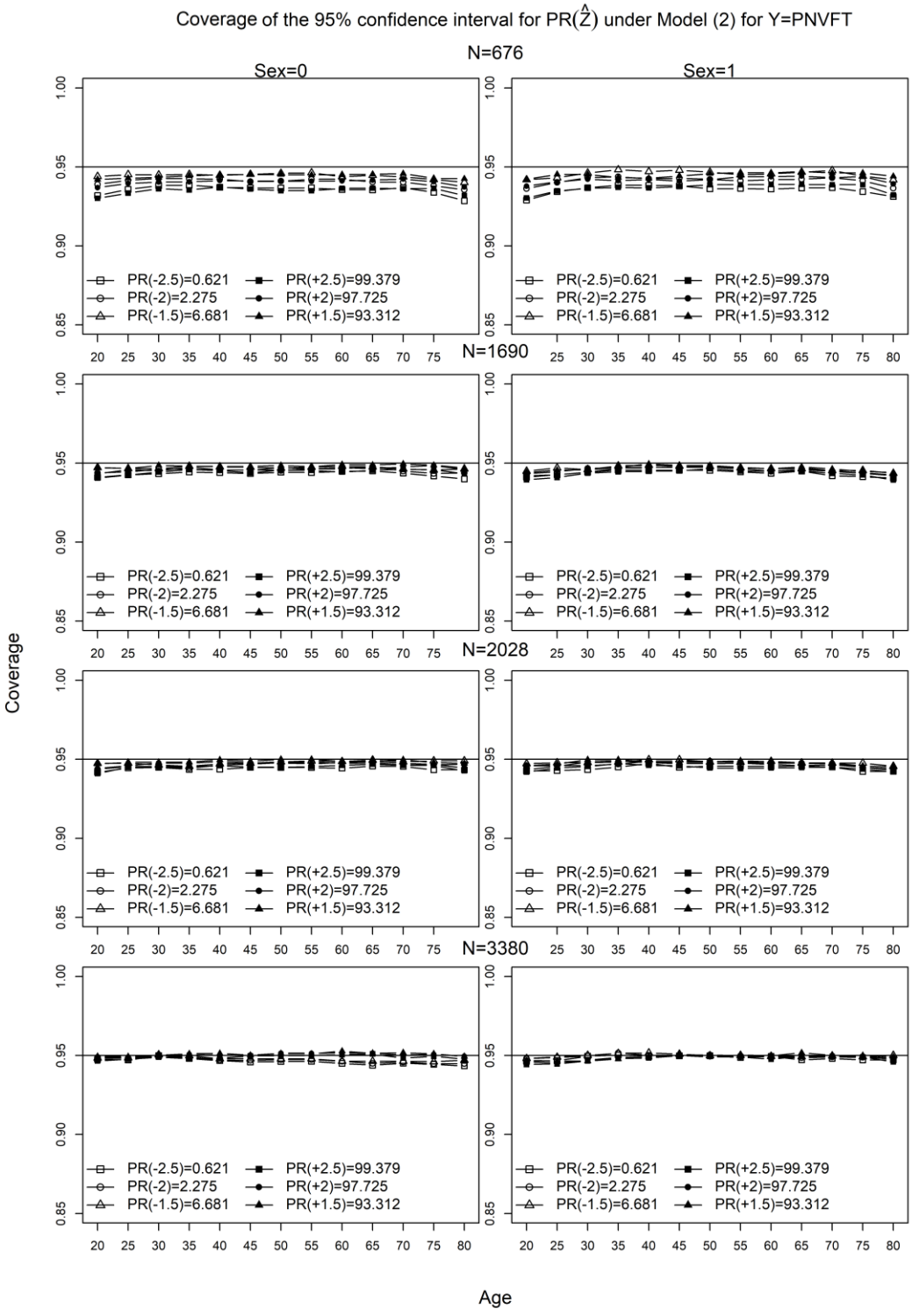

Figure S.B.1.41. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (2) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves).

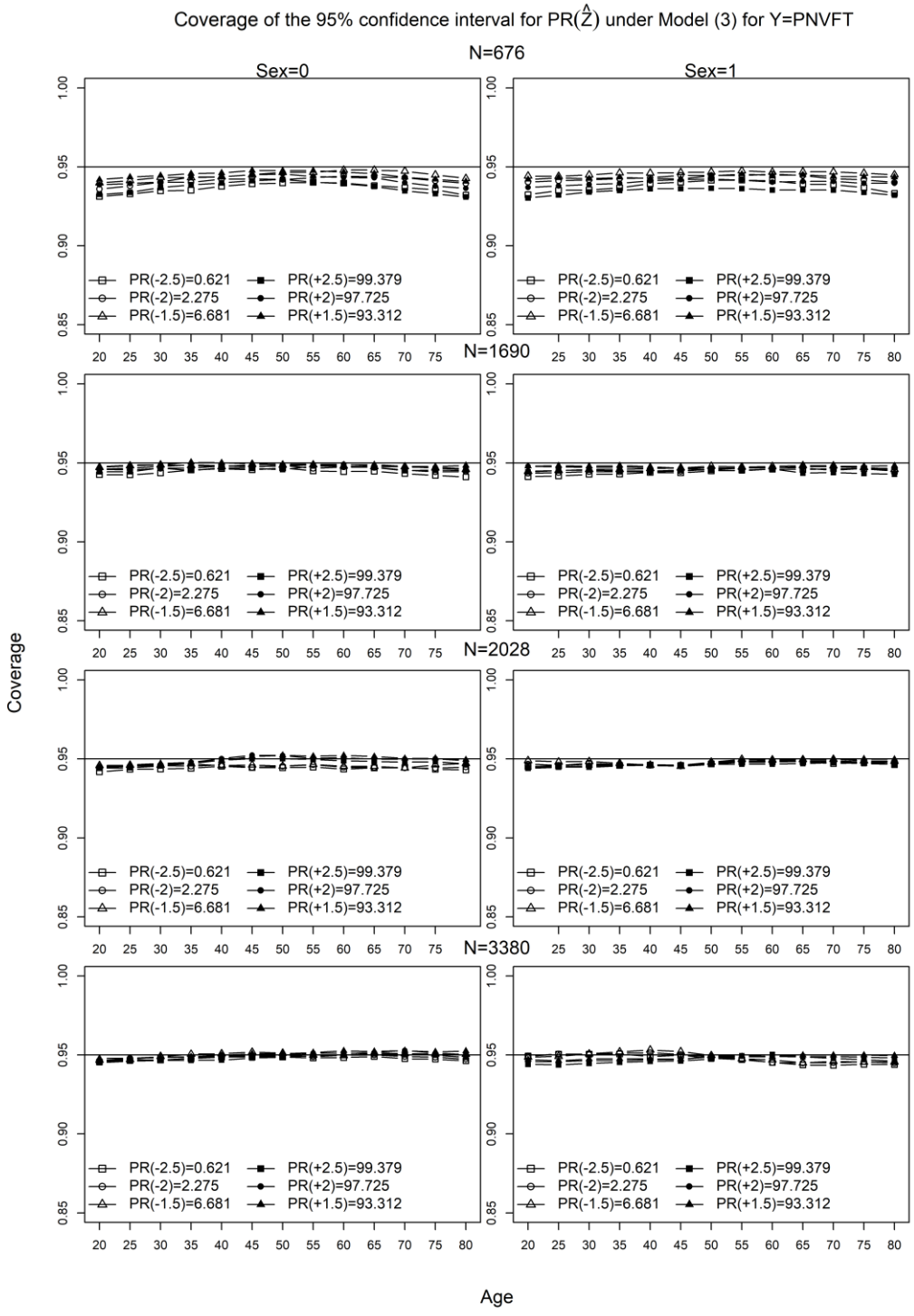

Figure S.B.1.42. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (3) for $Y = PNVFT$, as a function of age $\in [20,80]$ (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves).

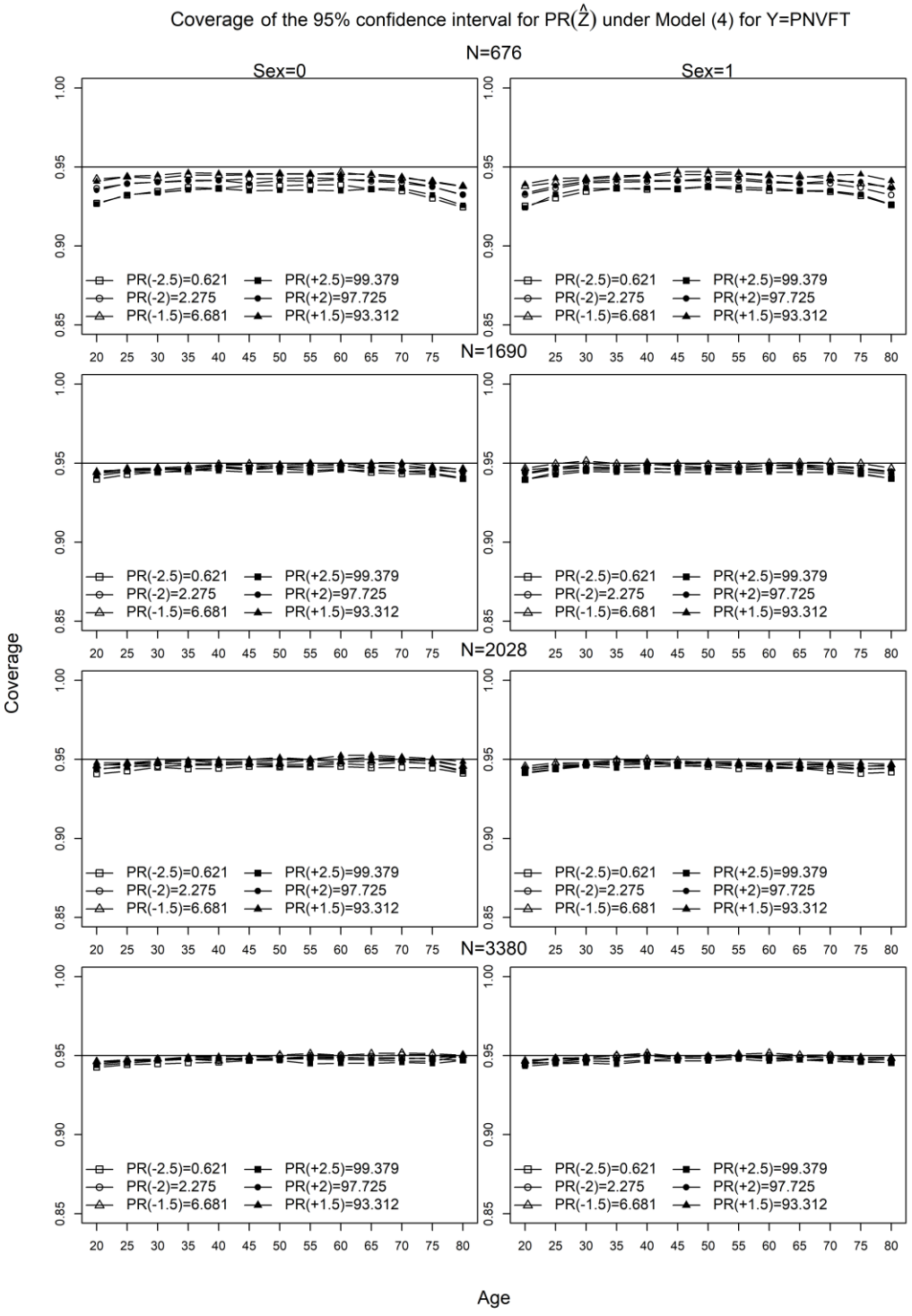

Figure S.B.1.43. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (4) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves).

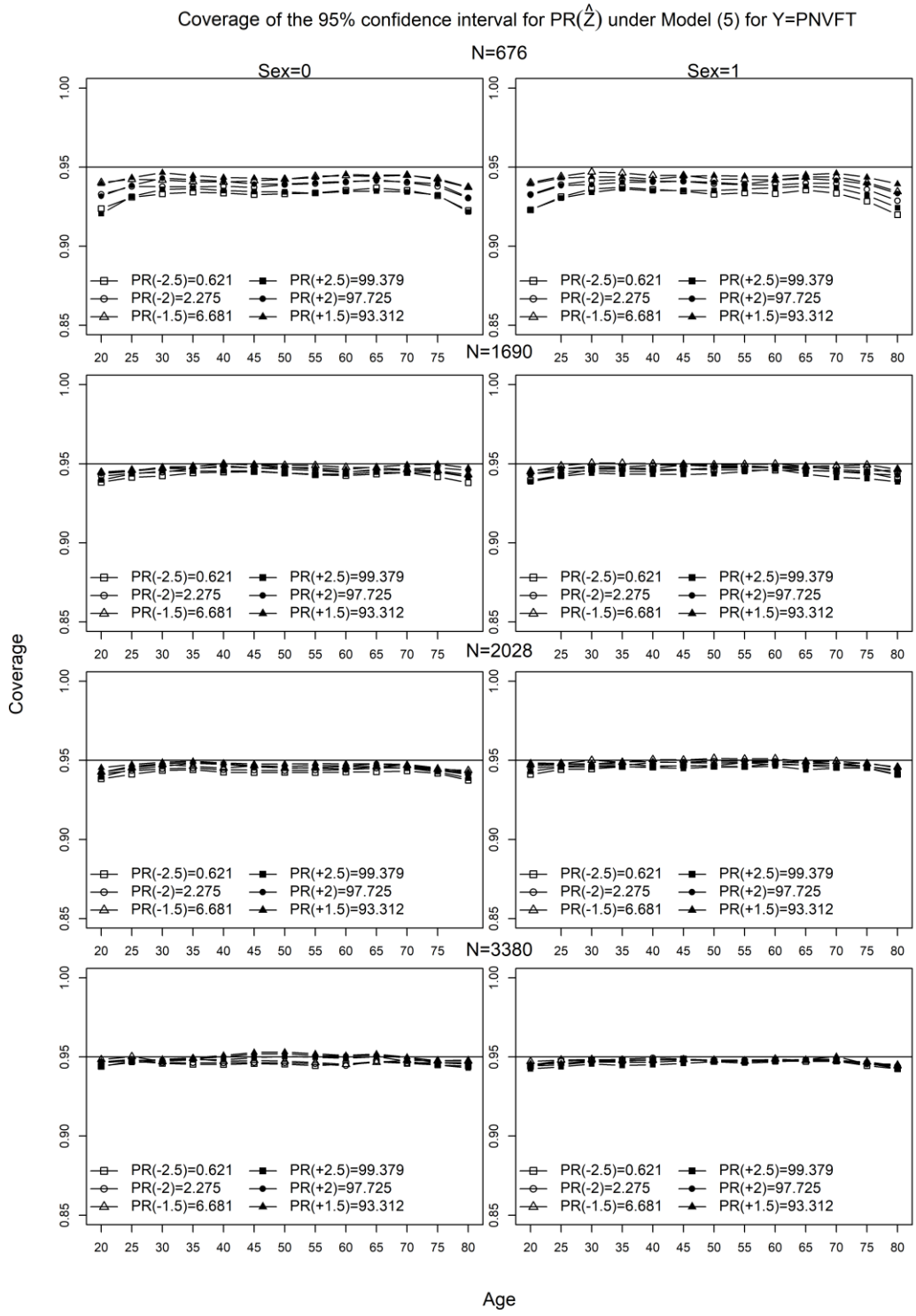

Figure S.B.1.44. Coverage of the 95% confidence interval for PR computed with equation (10), $\hat{V}\left(PR\left(\hat{Z}\right)\right)$, under model (5) for $Y = PNVFT$, as a function of age $\in$ [20,80] (x-axis) and sex $\in \{0,1\}$ (columns), for different sample sizes $N \in \{676,1690,2028,3380\}$ (rows), and $PR \in \{0.621,2.275,6.681,93.312,97.725,99.379\}$ (curves).