1 Sensitivity analysis

To evaluate the sensitivity of our inference to prior specifications in the GPPs, we varied the number of knots ($\widetilde{K}$) and the covariance function smoothness parameter (ν_d). While the manuscript uses $\widetilde{K} = 100$ and $\nu_d = 2.0$, we examined all combinations of $\widetilde{K} \in \{30, 50\}$ and $\nu_d \in \{0.5, 1.5, 2.0\}$, finding stable effect estimates, indicating robustness. These results confirm that our conclusions remain reliable under different priors, supported by trace plots and convergence diagnostics.

$\widetilde{K} = 30$ and $\nu_d = 0.5$:

1. Inclusion probabilities for eight covariates (Table 1)
2. Posterior estimates of assay accuracy probabilities (Table 2)
3. Effect estimates (Figures 1-3).

$\widetilde{K} = 50$ and $\nu_d = 0.5$:

1. Inclusion probabilities for eight covariates (Table 3)
2. Posterior estimates of assay accuracy probabilities (Table 4)
3. Effect estimates (Figures 4-6).

$\widetilde{K} = 30$ and $\nu_d = 1.5$:

1. Inclusion probabilities for eight covariates (Table 5)
2. Posterior estimates of assay accuracy probabilities (Table 6)
3. Effect estimates (Figures 7-9).

$\widetilde{K} = 50$ and $\nu_d = 1.5$:

1. Inclusion probabilities for eight covariates (Table 7)
2. Posterior estimates of assay accuracy probabilities (Table 8)
3. Effect estimates (Figures 10-12).

$\widetilde{K} = 30$ and $\nu_d = 2.0$:

1. Inclusion probabilities for eight covariates (Table 9)
2. Posterior estimates of assay accuracy probabilities (Table 10)
3. Effect estimates (Figures 13-15).

$\widetilde{K} = 50$ and $\nu_d = 2.0$:

1. Inclusion probabilities for eight covariates (Table 11)
2. Posterior estimates of assay accuracy probabilities (Table 12)
3. Effect estimates (Figures 16-18).

Table 1: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 0.5$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.998	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.885	(0.692, 0.999)
$S_{e(3)}$	Swab pool	0.920	(0.772, 1.000)
$S_{p(1)}$	Swab individual	0.978	(0.963, 0.993)
$S_{p(2)}$	Urine individual	0.991	(0.978, 1.000)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 2: Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 0.5$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.991	0.493	0.498
x_4	Contact with STD	1.000	0.939	0.061
x_2	New partner	0.991	0.815	0.176
x_6	Cervical friability	0.789	0.699	0.090
x_3	Multiple partners	0.678	0.656	0.022
x_5	Symptoms	0.120	0.085	0.035
x_8	PID	0.060	0.036	0.023
x_7	Cervicitis	0.030	0.024	0.006

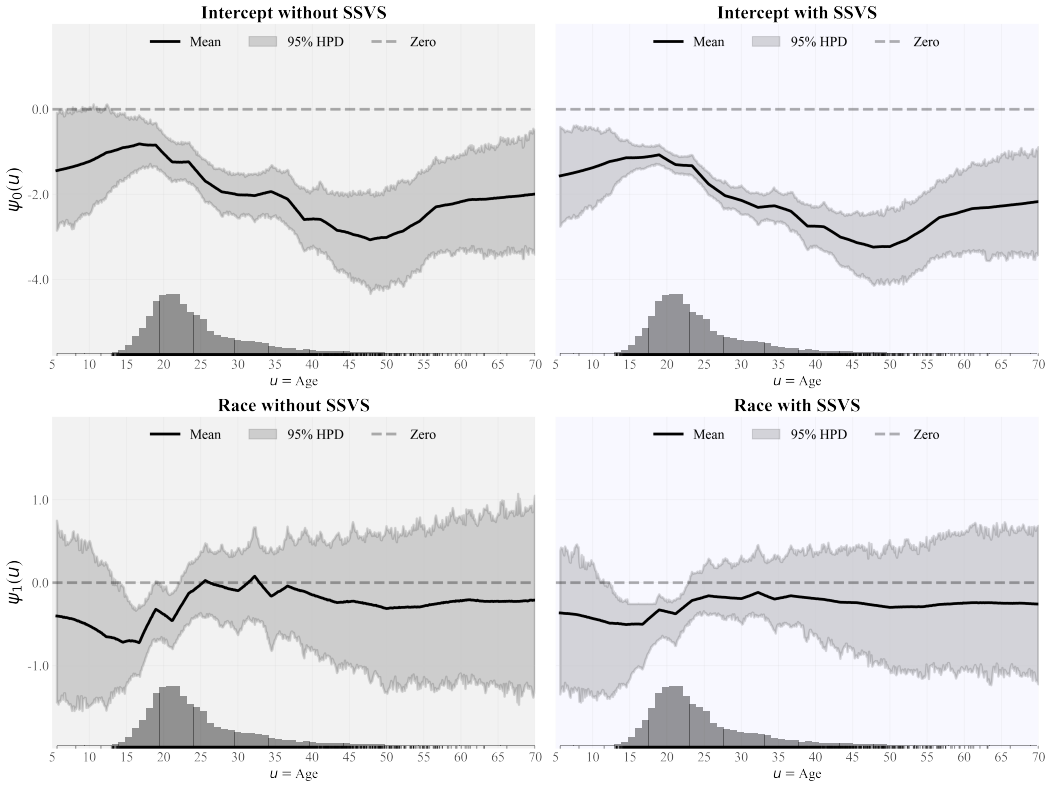

Figure 1: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 0.5$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

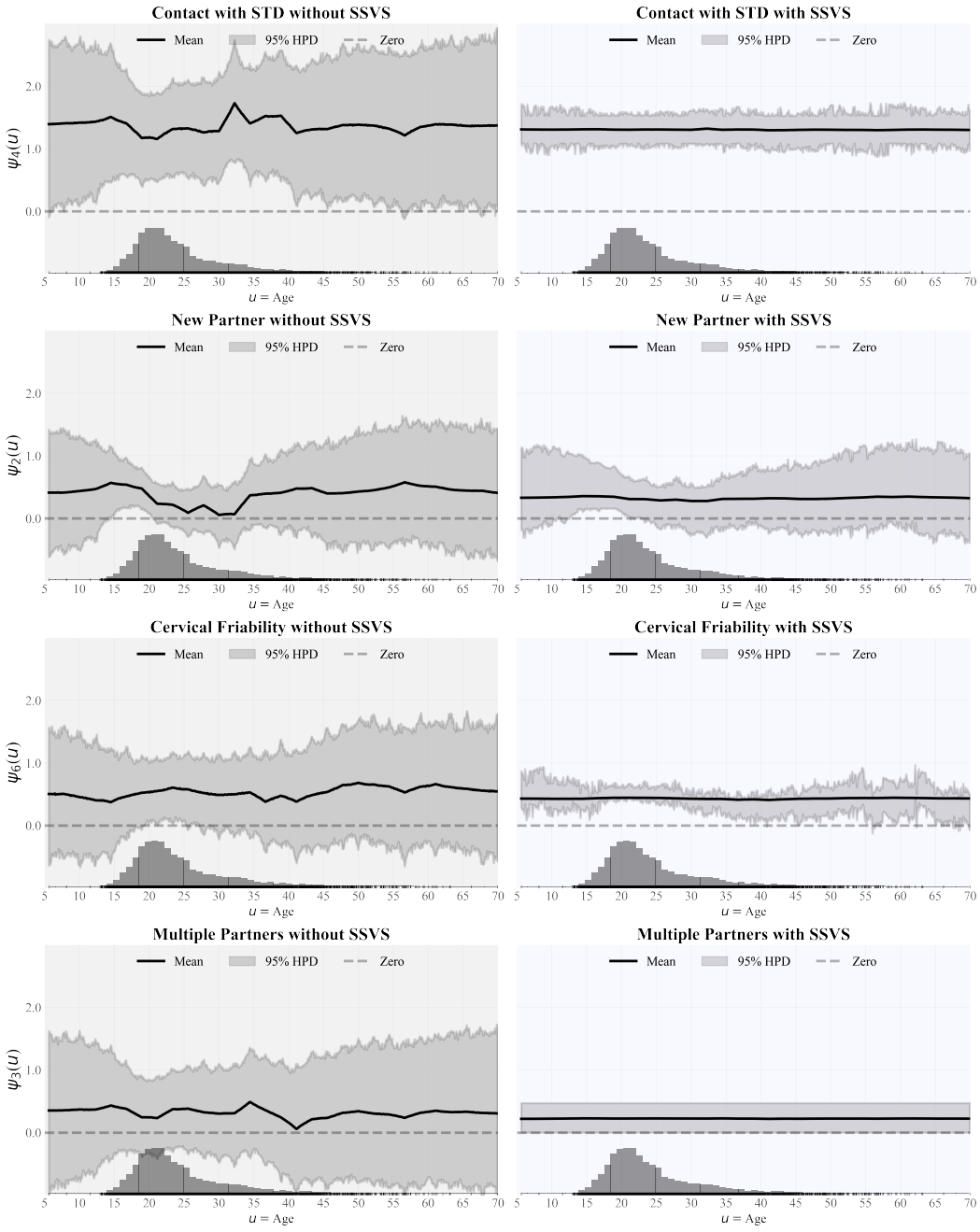

Figure 2: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 0.5$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

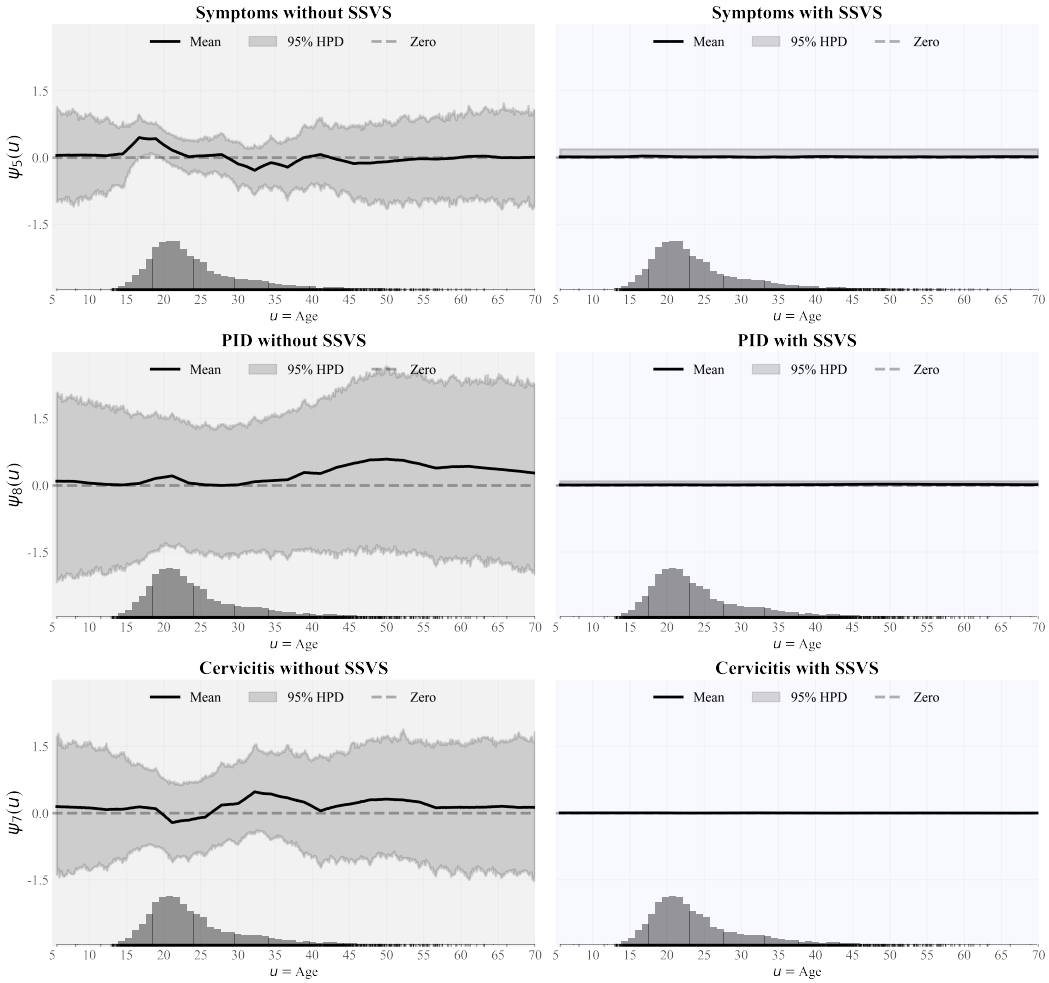

Figure 3: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 0.5$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

Table 3: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 0.5$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.999	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.887	(0.712, 0.999)
$S_{e(3)}$	Swab pool	0.917	(0.790, 0.999)
$S_{p(1)}$	Swab individual	0.978	(0.964, 0.991)
$S_{p(2)}$	Urine individual	0.992	(0.980, 0.999)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 4: Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 0.5$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.990	0.512	0.478
x_4	Contact with STD	1.000	0.951	0.049
x_2	New partner	0.994	0.931	0.063
x_6	Cervical friability	0.809	0.733	0.076
x_3	Multiple partners	0.685	0.665	0.020
x_5	Symptoms	0.181	0.065	0.116
x_8	PID	0.068	0.052	0.016
x_7	Cervicitis	0.016	0.010	0.006

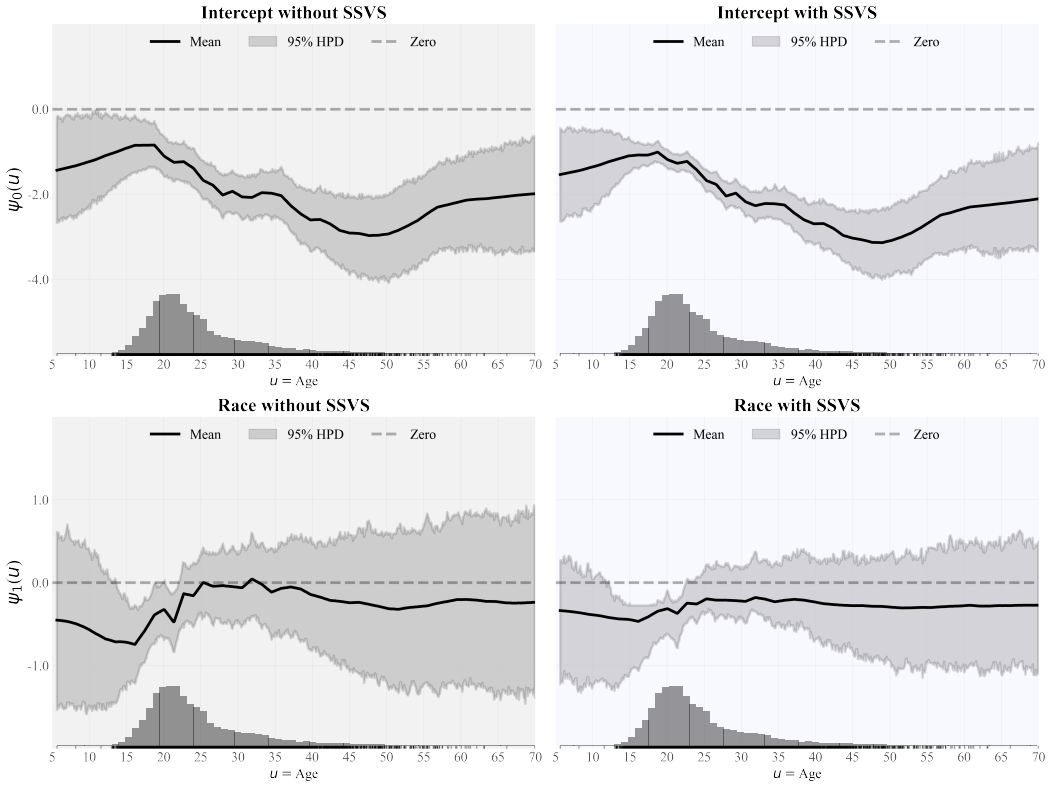

Figure 4: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 0.5$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

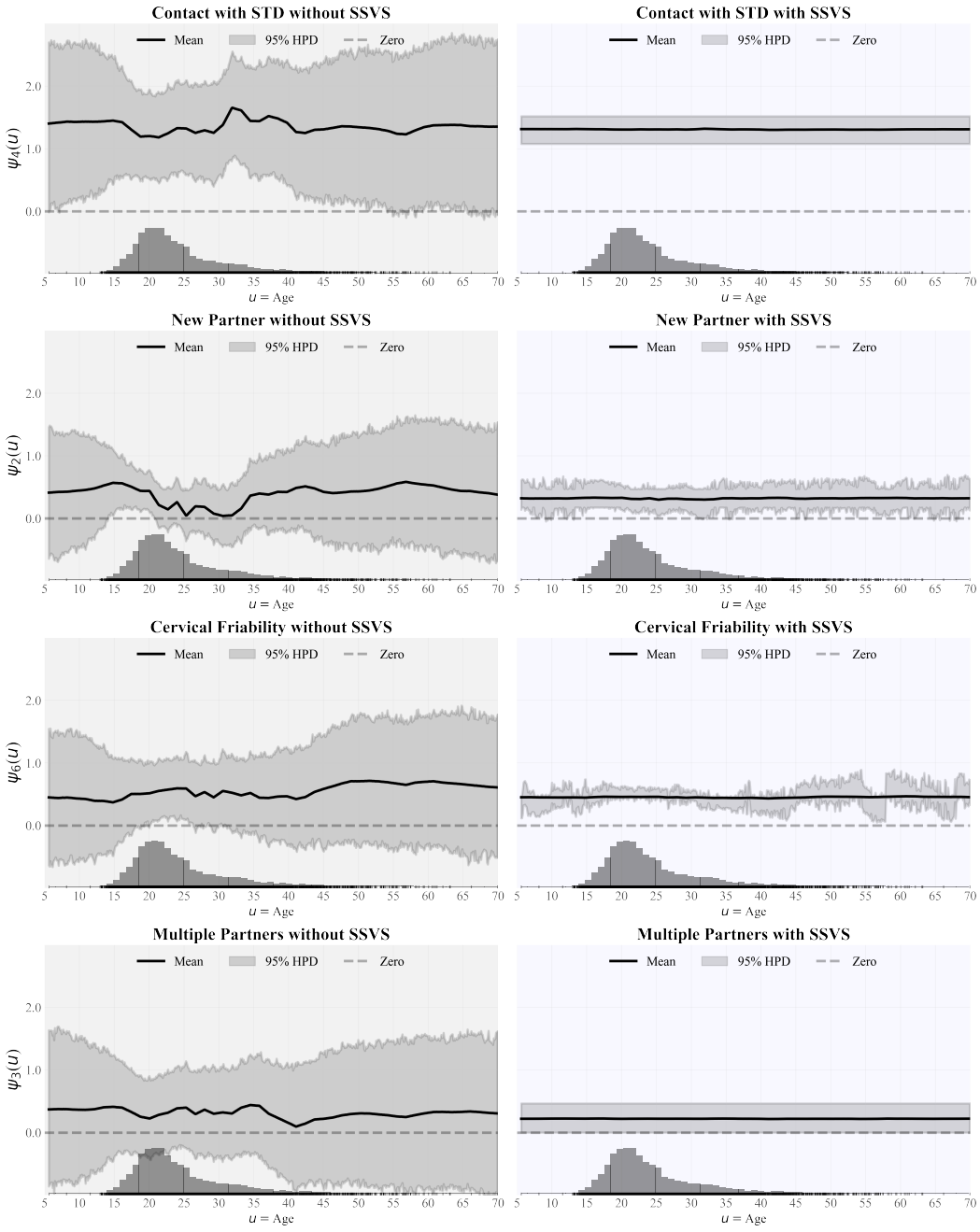

Figure 5: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 0.5$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

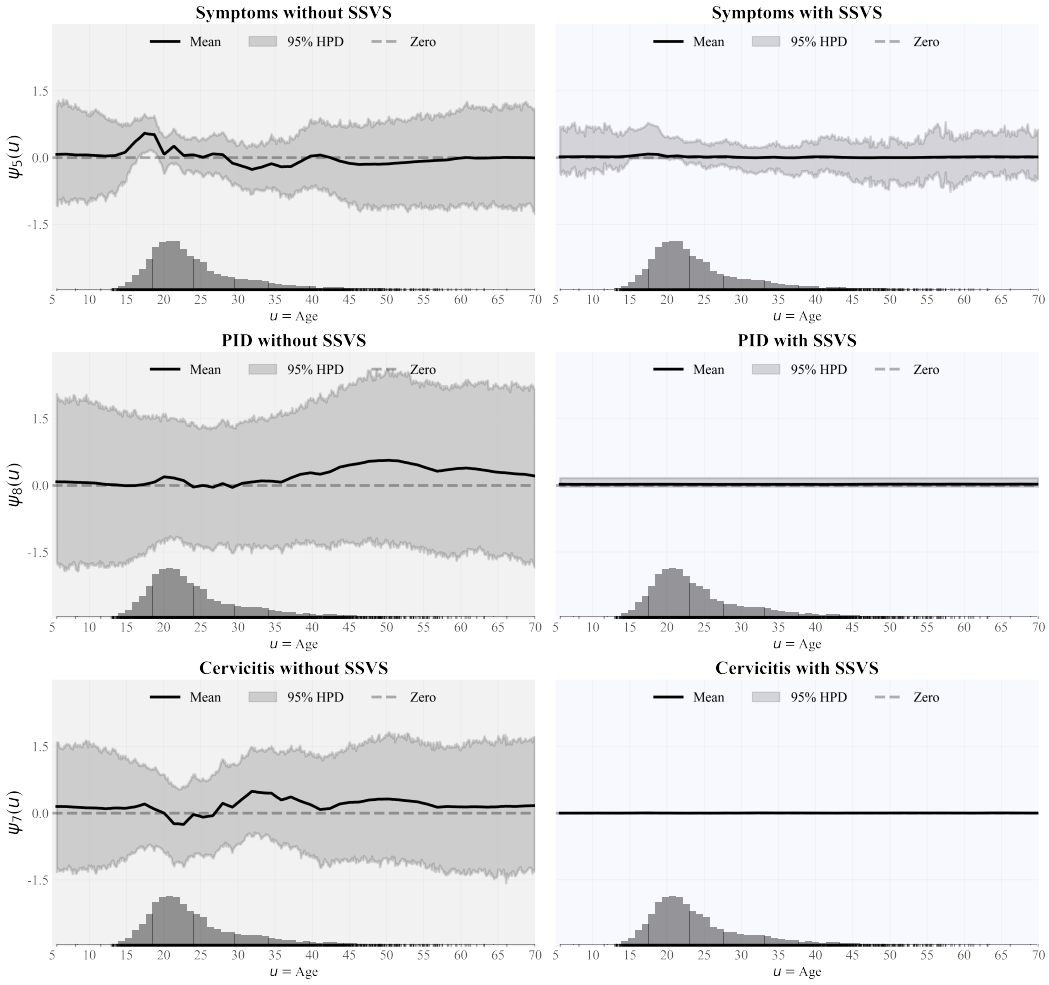

Figure 6: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 0.5$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

Table 5: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 1.5$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.998	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.903	(0.718, 0.999)
$S_{e(3)}$	Swab pool	0.932	(0.792, 0.999)
$S_{p(1)}$	Swab individual	0.977	(0.964, 0.992)
$S_{p(2)}$	Urine individual	0.992	(0.980, 0.999)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 6: Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 1.5$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.990	0.492	0.498
x_4	Contact with STD	1.000	0.930	0.070
x_2	New partner	0.992	0.758	0.234
x_6	Cervical friability	0.849	0.691	0.158
x_3	Multiple partners	0.673	0.564	0.110
x_5	Symptoms	0.086	0.070	0.016
x_8	PID	0.060	0.042	0.018
x_7	Cervicitis	0.027	0.016	0.011

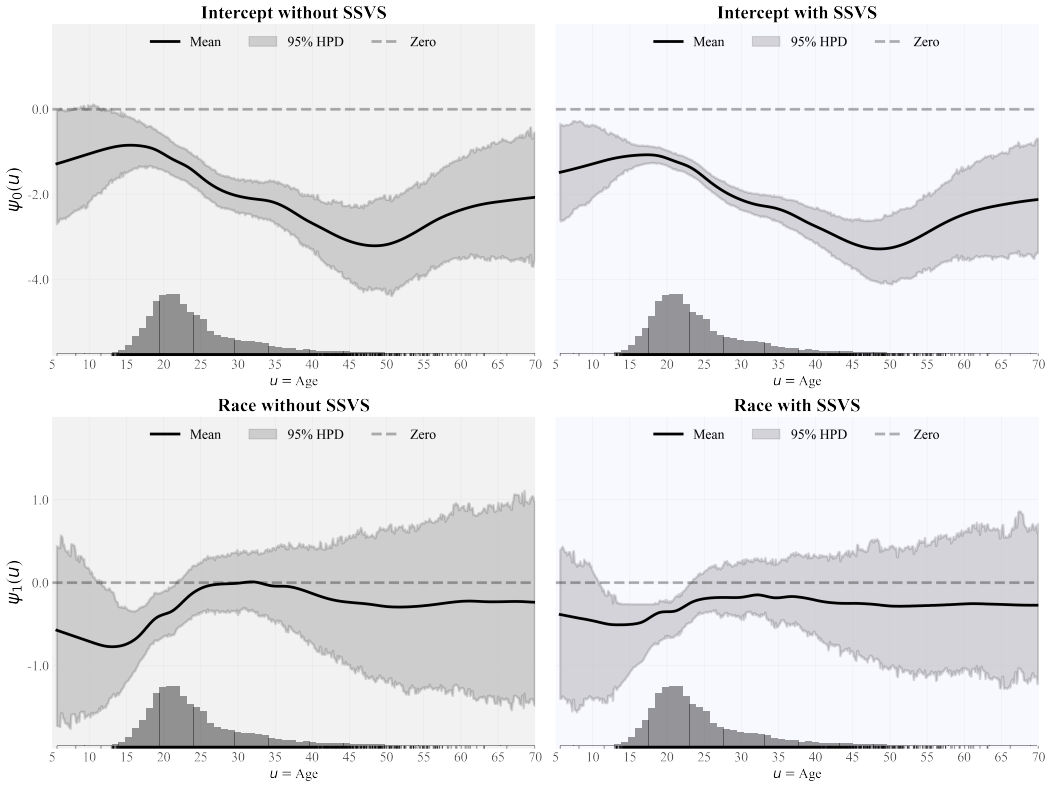

Figure 7: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 1.5$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

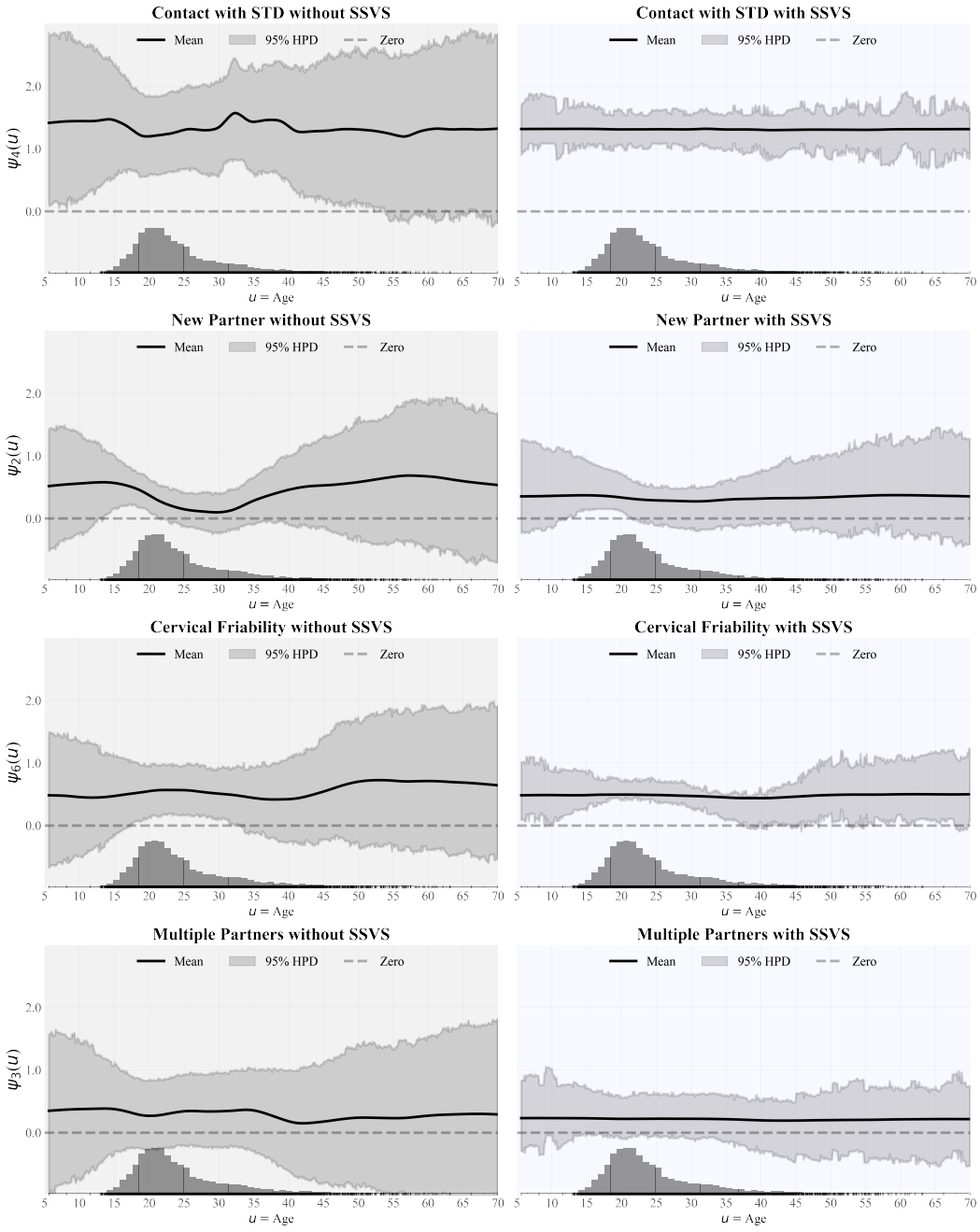

Figure 8: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 1.5$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

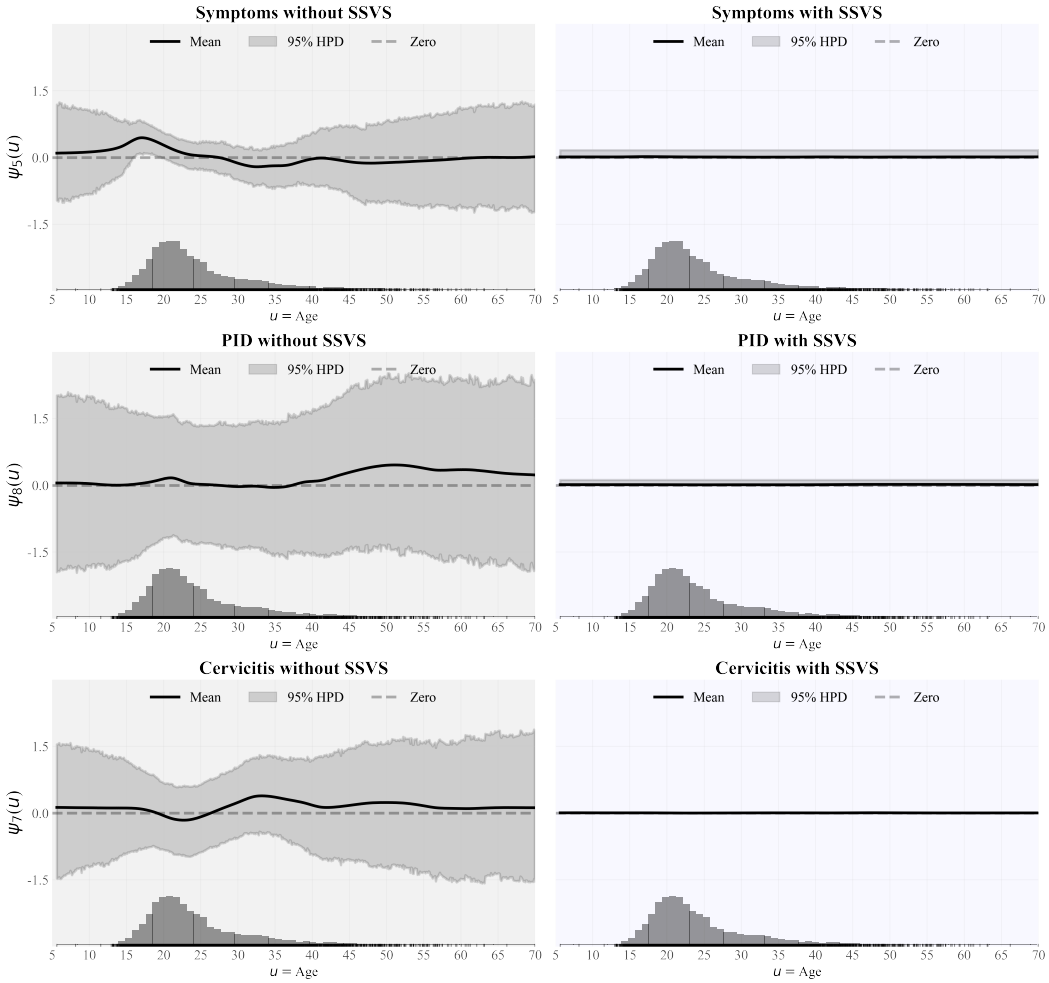

Figure 9: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 1.5$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

Table 7: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 1.5$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.998	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.895	(0.735, 0.999)
$S_{e(3)}$	Swab pool	0.924	(0.799, 0.999)
$S_{p(1)}$	Swab individual	0.978	(0.964, 0.992)
$S_{p(2)}$	Urine individual	0.992	(0.980, 0.999)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 8: Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 1.5$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.983	0.554	0.428
x_4	Contact with STD	1.000	0.938	0.062
x_2	New partner	0.995	0.844	0.150
x_6	Cervical friability	0.884	0.711	0.173
x_3	Multiple partners	0.699	0.640	0.059
x_5	Symptoms	0.160	0.064	0.096
x_7	Cervicitis	0.028	0.019	0.009
x_8	PID	0.024	0.020	0.004

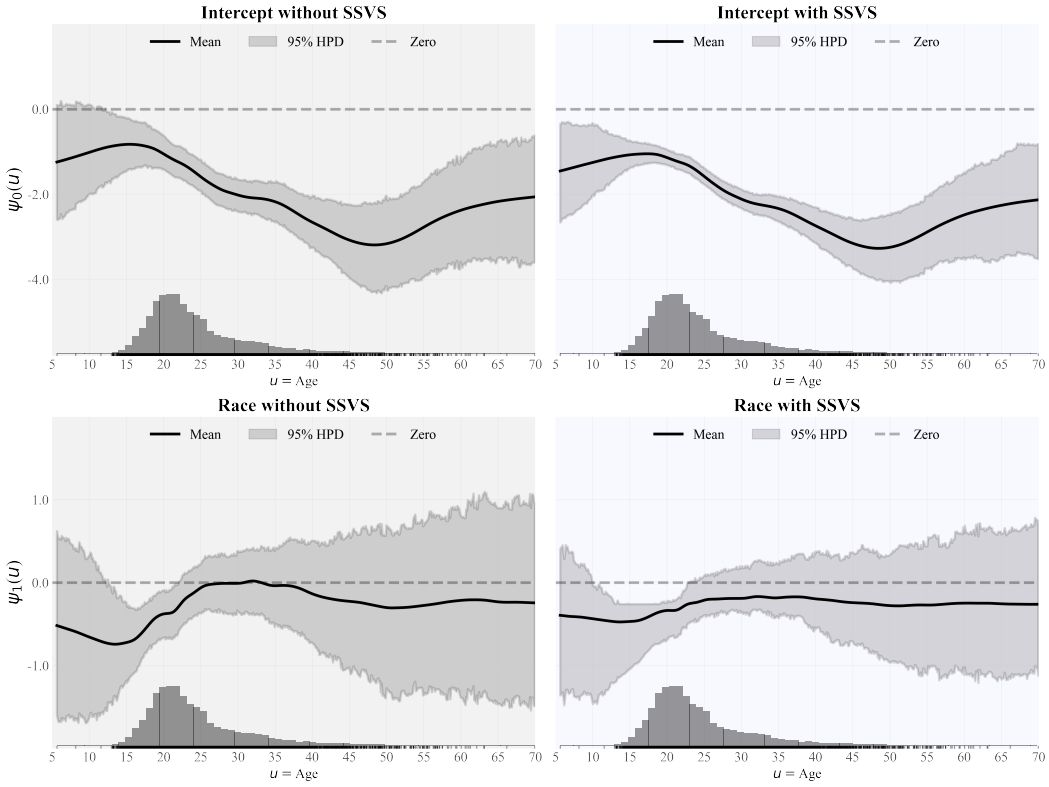

Figure 10: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 1.5$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

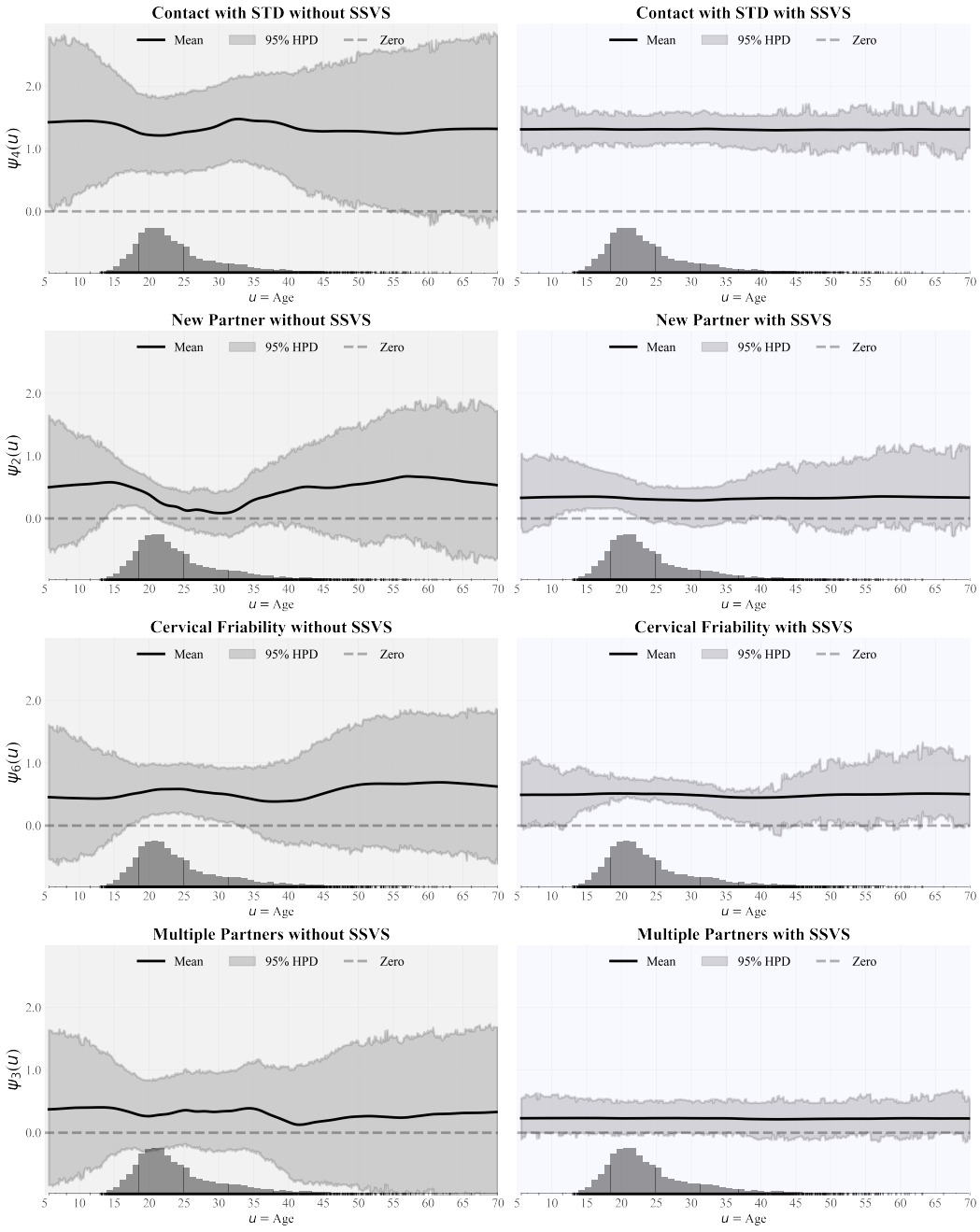

Figure 11: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 1.5$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

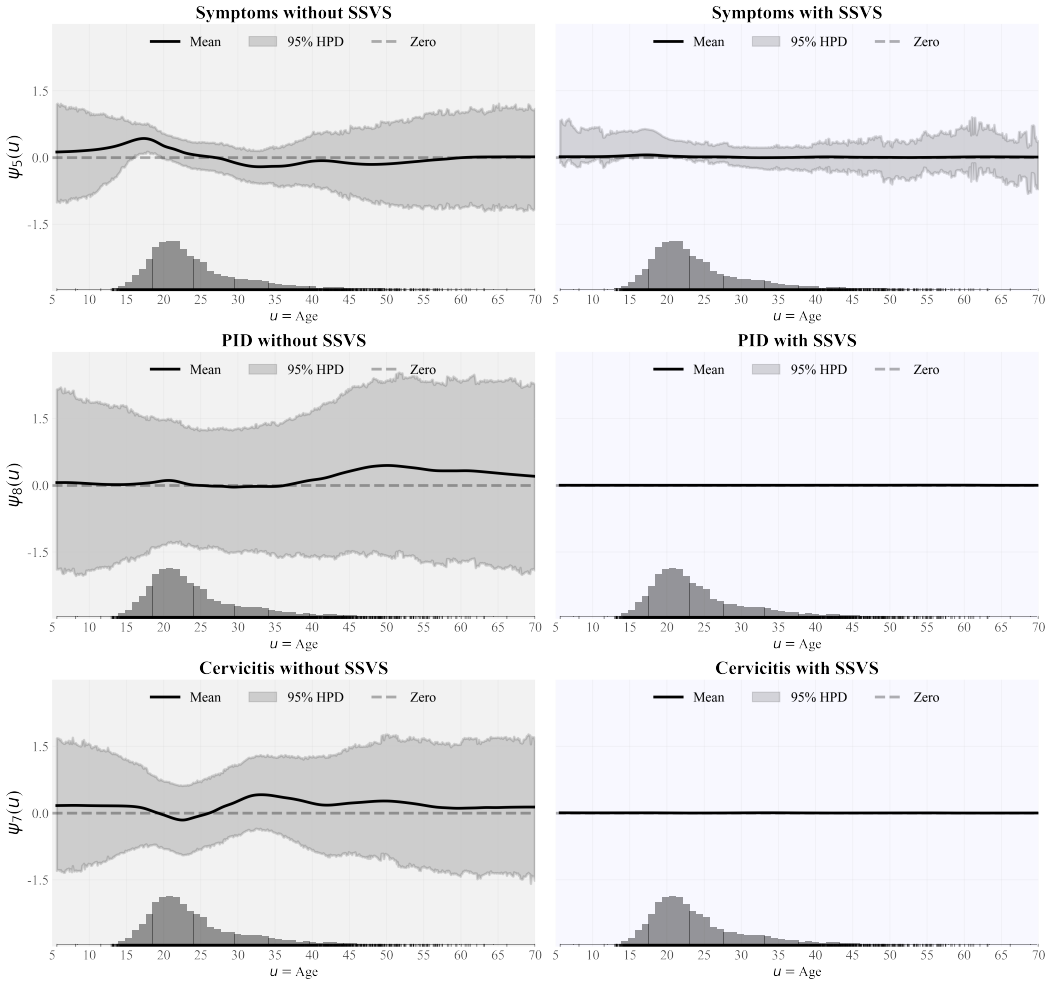

Figure 12: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 1.5$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

Table 9: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 2.0$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.999	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.913	(0.744, 0.999)
$S_{e(3)}$	Swab pool	0.929	(0.809, 0.999)
$S_{p(1)}$	Swab individual	0.977	(0.964, 0.992)
$S_{p(2)}$	Urine individual	0.993	(0.982, 0.999)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 10: Iowa chlamydia data under $\widetilde{K} = 30$ and $\nu_d = 2.0$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.994	0.368	0.625
x_4	Contact with STD	1.000	0.971	0.029
x_2	New partner	0.992	0.756	0.236
x_6	Cervical friability	0.846	0.639	0.206
x_3	Multiple partners	0.731	0.674	0.056
x_5	Symptoms	0.160	0.068	0.092
x_8	PID	0.086	0.058	0.028
x_7	Cervicitis	0.018	0.010	0.007

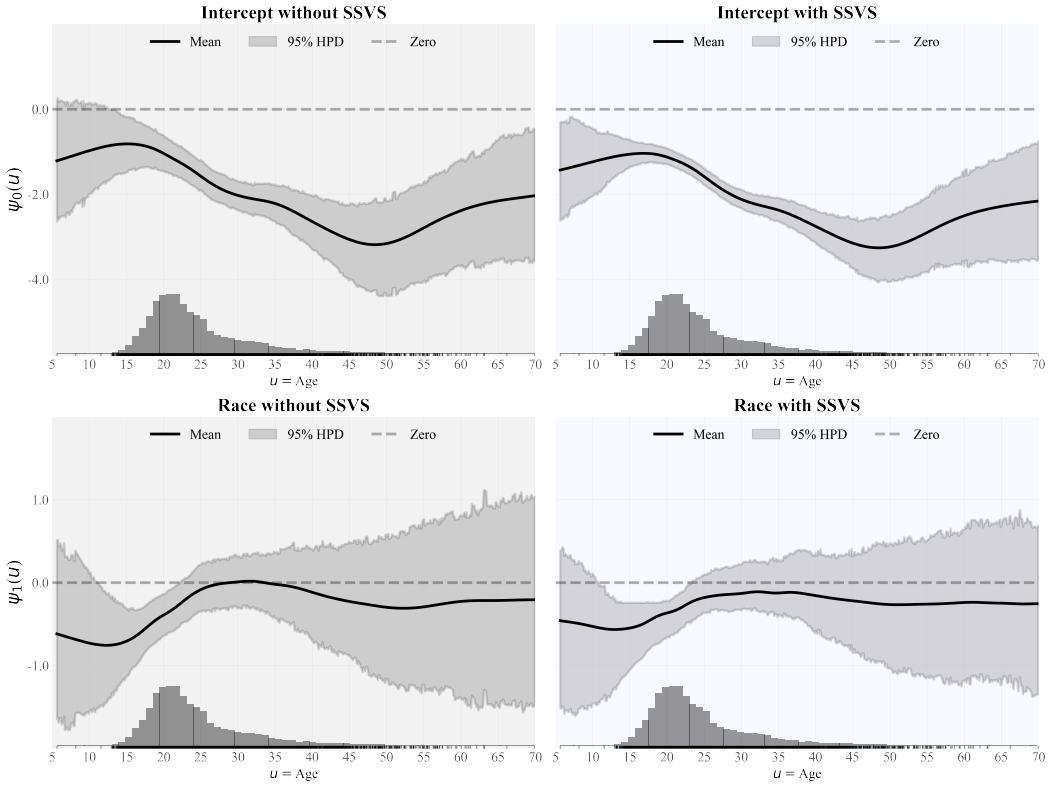

Figure 13: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 2.0$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

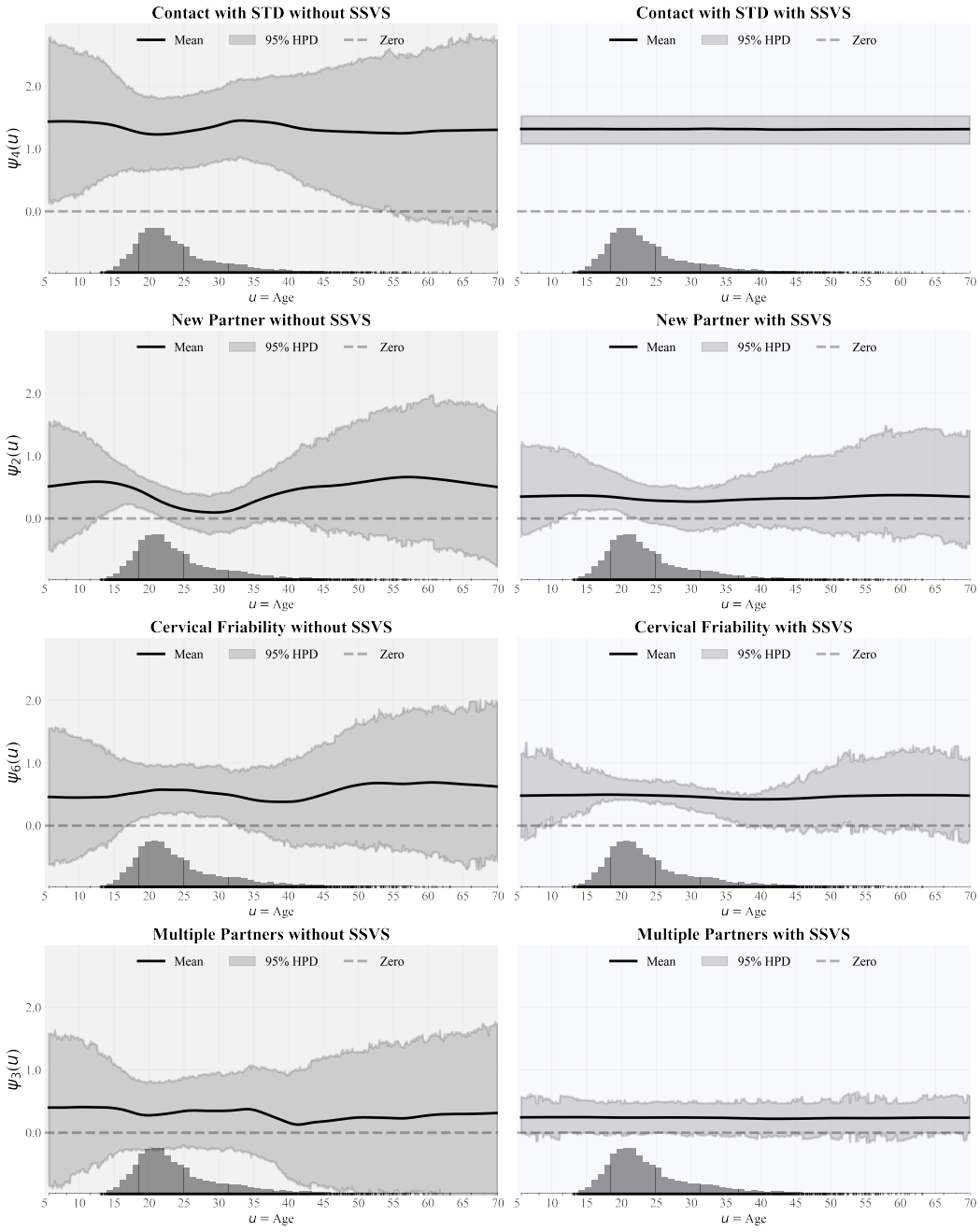

Figure 14: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 2.0$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

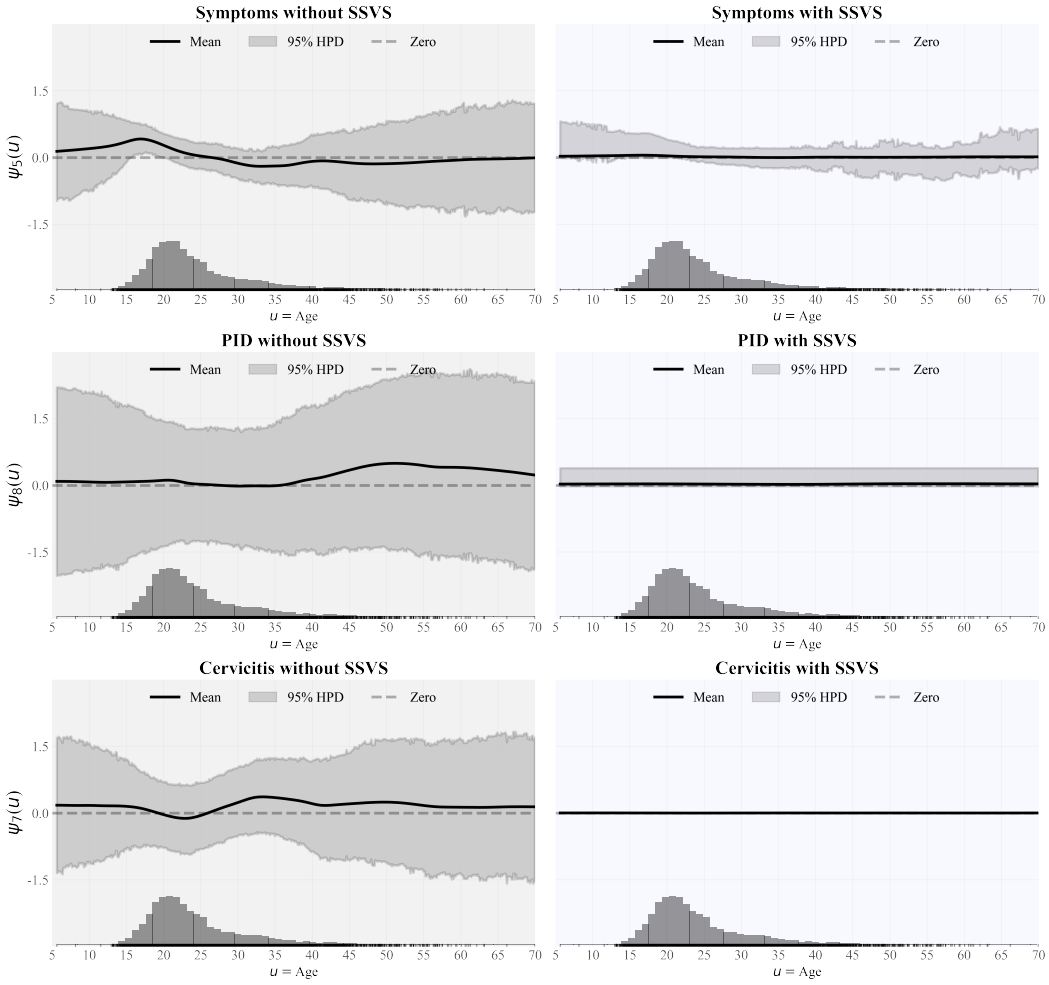

Figure 15: Iowa group testing data under $\widetilde{K} = 30$ and $\nu_d = 2.0$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

Table 11: Sensitivity analysis. Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 2.0$. Posterior mean and 95% highest posterior density (95% HPD) credible intervals are shown.

Parameter	Description	Mean	95% HPD interval
$S_{e(1)}$	Swab individual	0.998	(0.996, 1.000)
$S_{e(2)}$	Urine individual	0.879	(0.709, 0.999)
$S_{e(3)}$	Swab pool	0.911	(0.769, 0.999)
$S_{p(1)}$	Swab individual	0.979	(0.964, 0.992)
$S_{p(2)}$	Urine individual	0.992	(0.979, 0.999)
$S_{p(3)}$	Swab pool	0.999	(0.998, 1.000)

Table 12: Iowa chlamydia data under $\widetilde{K} = 50$ and $\nu_d = 2.0$. Inclusion probabilities (IP) for eight covariates. Inclusion probabilities for fixed effects (IPF) and age-varying effects (IPV) are also shown. Note that IP = IPF + IPV.

Covariate	Description	IP	IPF	IPV
x_1	Race	0.992	0.339	0.653
x_4	Contact with STD	1.000	0.870	0.130
x_2	New partner	0.995	0.778	0.216
x_6	Cervical friability	0.866	0.807	0.058
x_3	Multiple partners	0.670	0.582	0.089
x_5	Symptoms	0.161	0.069	0.092
x_8	PID	0.054	0.047	0.007
x_7	Cervicitis	0.021	0.020	0.001

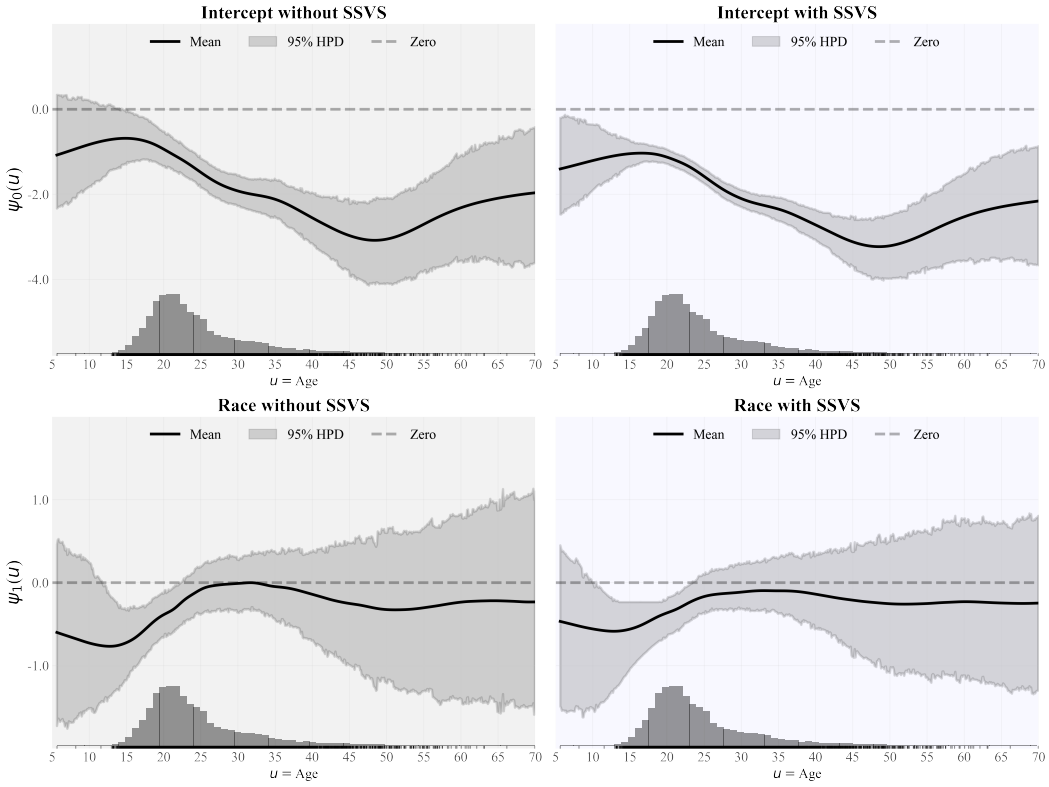

Figure 16: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 2.0$. Top: Age effect estimate without SSVS (left) and with SSVS (right). Bottom: Race effect estimate. Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

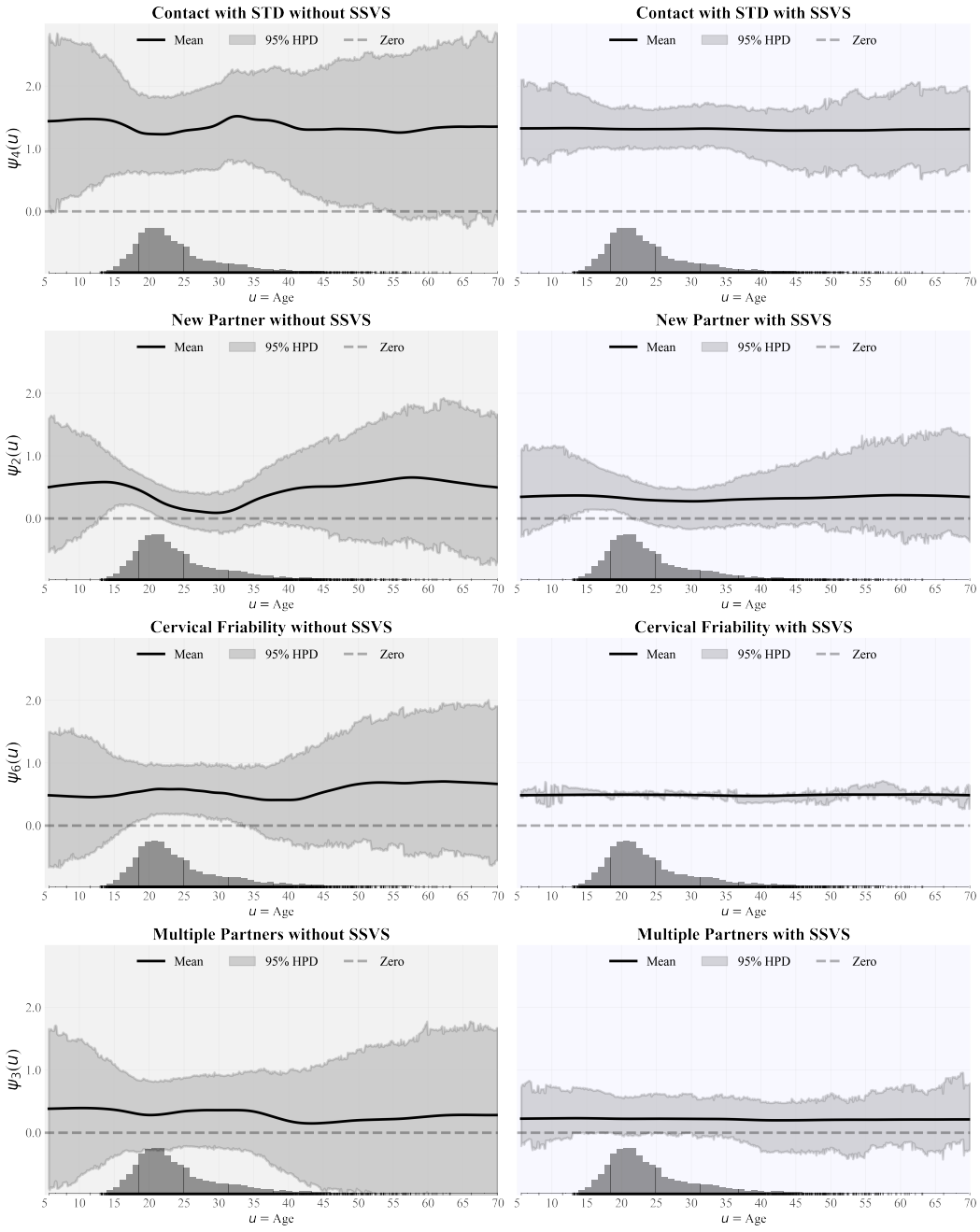

Figure 17: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 2.0$. Effect estimates for contact with STD (Row 1), new partner (Row 2), cervical friability (Row 3), and multiple partners (Row 4) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.

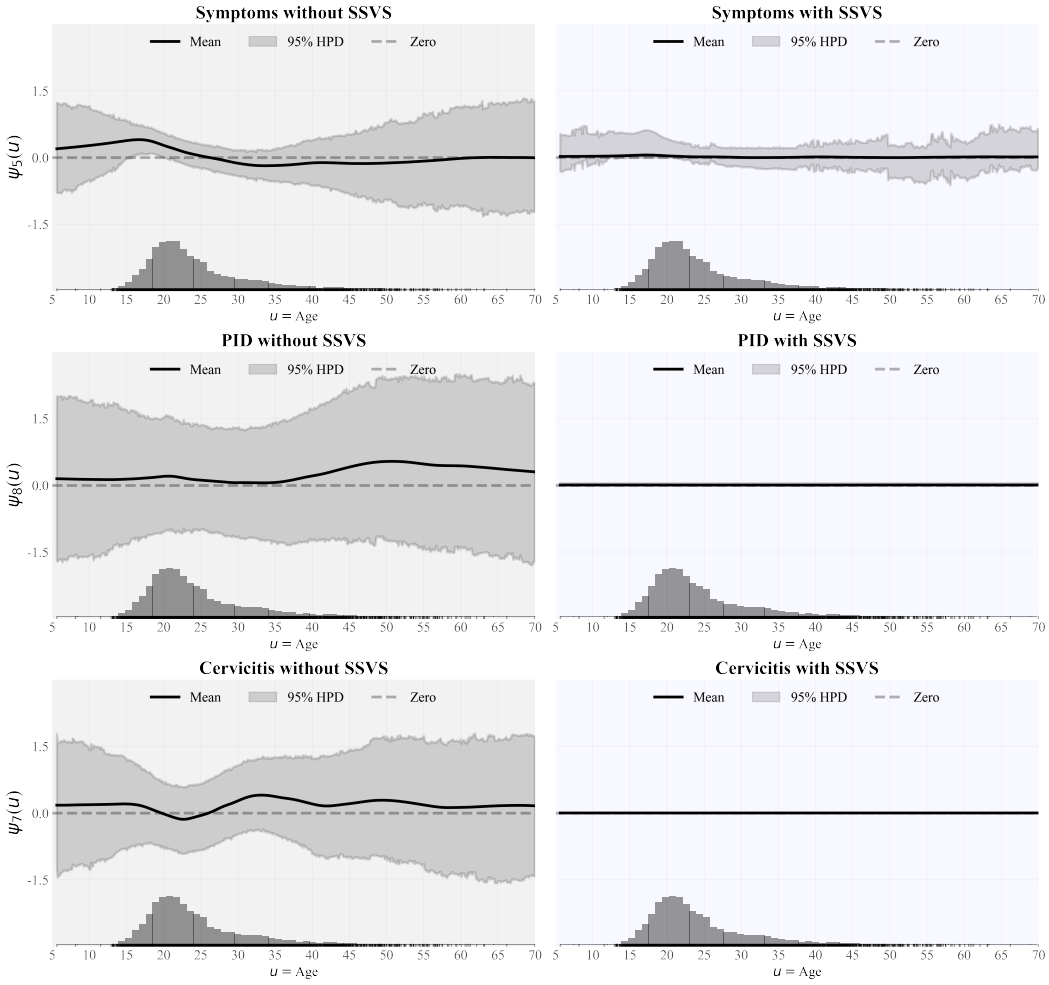

Figure 18: Iowa group testing data under $\widetilde{K} = 50$ and $\nu_d = 2.0$. Effect estimates for symptoms (Row 1), PID (Row 2), and cervicitis (Row 3) without SSVS (left) and with SSVS (right). Each subfigure shows the posterior mean (Mean) estimate and pointwise 95% HPD credible band (95% HPD). The zero reference line is shown dotted. A histogram of the ages is included at the bottom of each subfigure.