APPENDIX A. SUPPLEMENTAL FIGURES AND TABLES

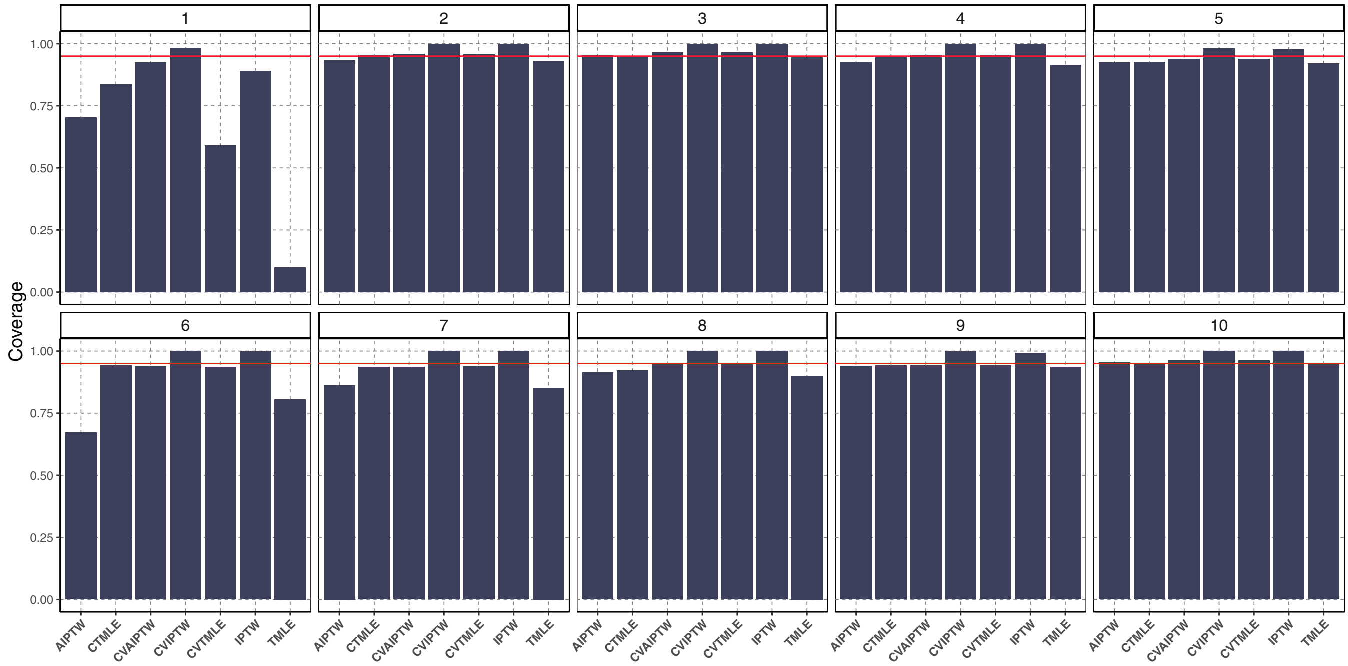

FIGURE A1 Coverage of confidence intervals in ten studies

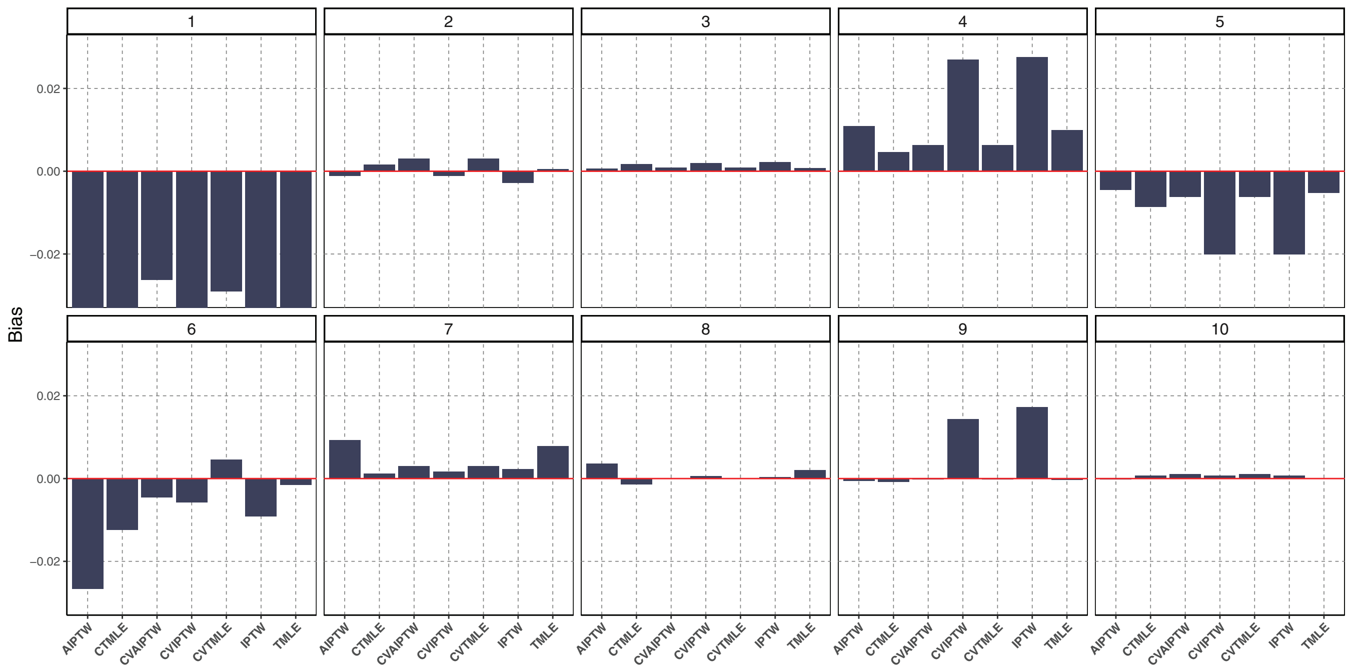

FIGURE A2 Bias of estimators in ten studies

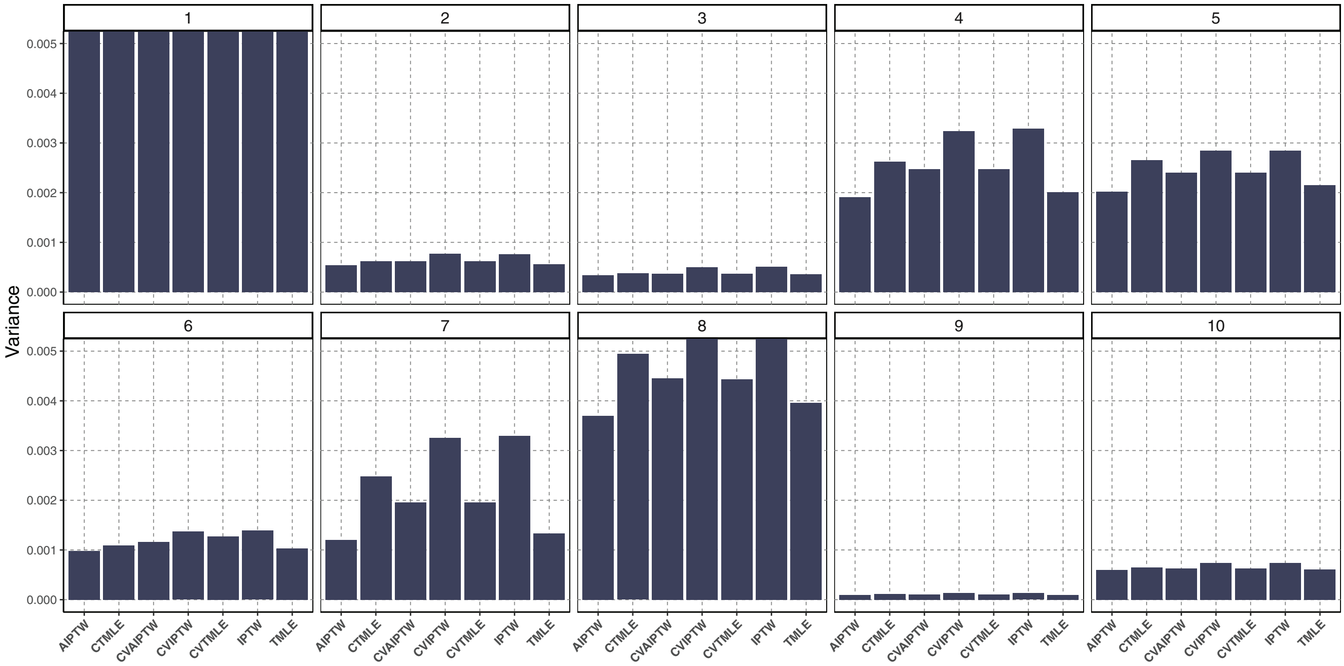

FIGURE A3 Variance of estimators in ten studies

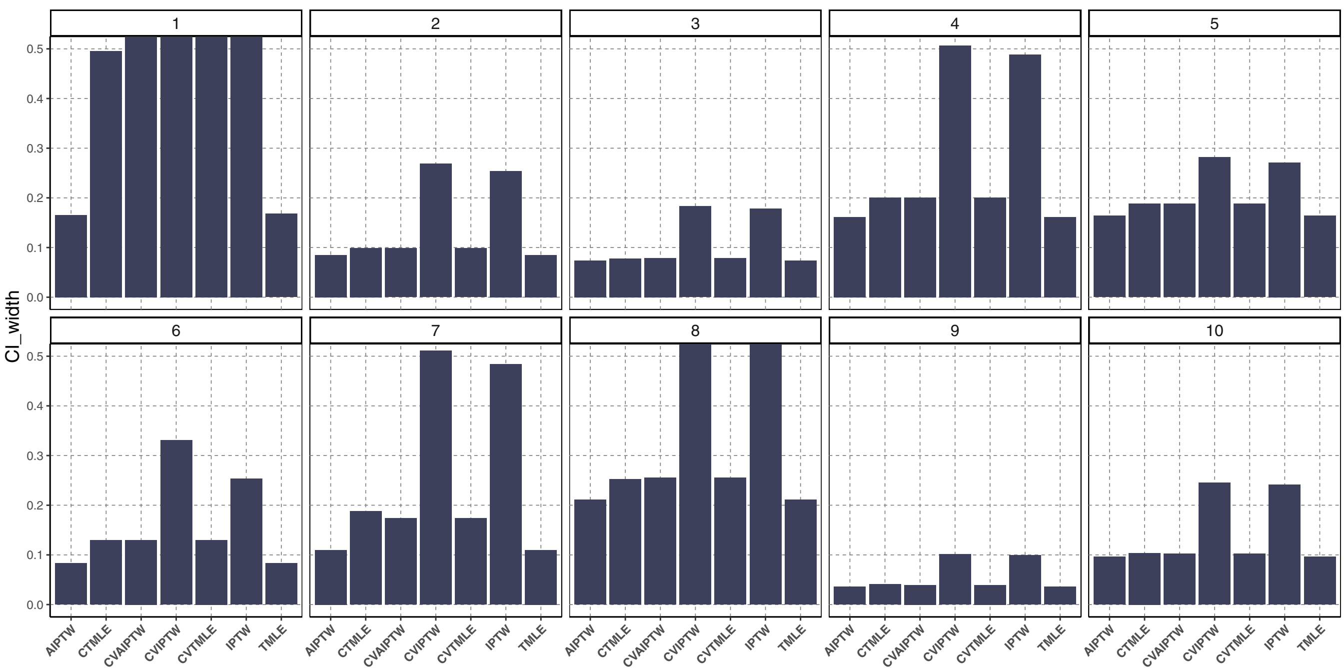

FIGURE A4 Average width of confidence intervals in ten studies

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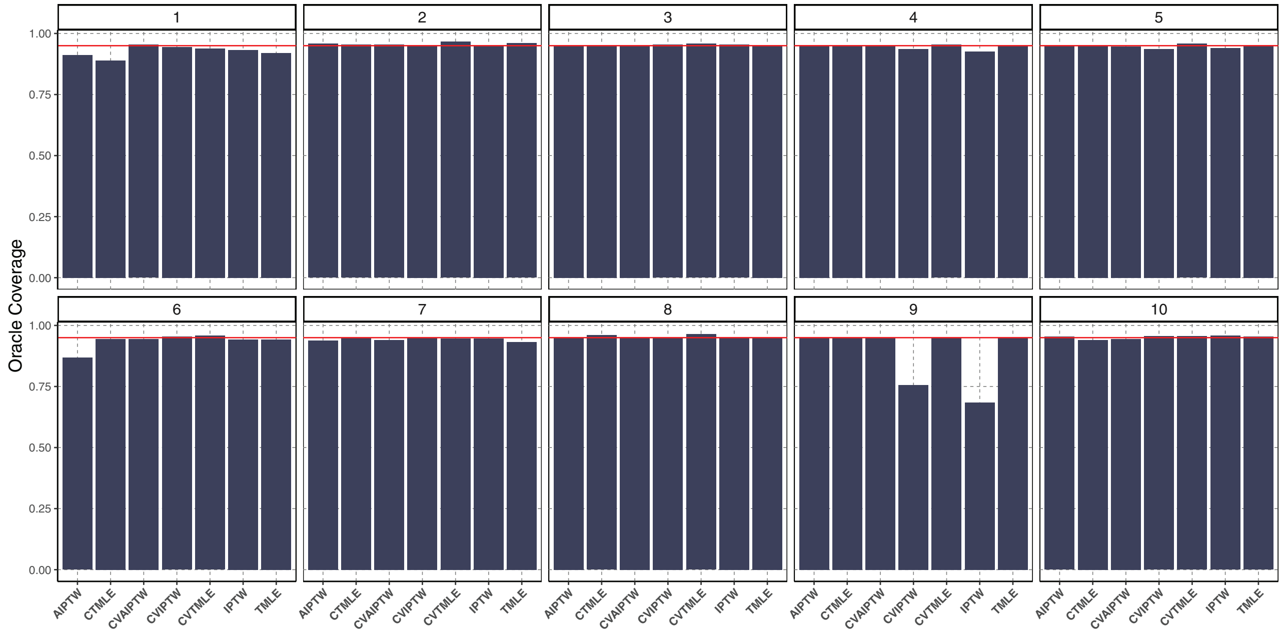

FIGURE A5 Coverage of oracle confidence intervals in ten studies

TABLE A1 Variables included in the undersmoothed HAL models for the outcome

Study ID	AllCovariates	IncludedCovariates
1	agedays, sex, month, brthmon, hdlvry, enstunt, enwast, W_mage, W_fage, W_meducyrs, W_feducyrs, W_nhh, W_parity, W_perdiar24, W_mhtcm, W_fhtcm, delta_W_mhtcm, delta_W_fhtcm, a	agedays*sex*W_fhtcm, agedays*month*brthmon, agedays*month*enstunt, agedays*month*W_mage, agedays*month*W_meducyrs, agedays*month*W_feducyrs, agedays*month*W_mhtcm, agedays*brthmon*enstunt, agedays*brthmon*W_mage, agedays*brthmon*W_fage, agedays*brthmon*W_meducyrs, agedays*brthmon*W_feducyrs, agedays*brthmon*W_nhh, agedays*brthmon*W_fhtcm, agedays*hdlvry*W_mhtcm, agedays*hdlvry*W_fhtcm, agedays*enstunt*W_fage, agedays*enstunt*W_feducyrs, agedays*enstunt*W_mhtcm, agedays*enstunt*W_fhtcm, agedays*enwast*W_feducyrs, agedays*enwast*W_fhtcm, agedays*W_mage*W_fage, agedays*W_mage*W_meducyrs, agedays*W_mage*W_feducyrs, agedays*W_mage*W_nhh, agedays*W_mage*W_mhtcm, agedays*W_mage*W_fhtcm, agedays*W_fage*W_meducyrs, agedays*W_fage*W_feducyrs, agedays*W_fage*W_parity, agedays*W_fage*W_fhtcm, agedays*W_meducyrs*W_feducyrs, agedays*W_meducyrs*W_fhtcm, agedays*W_feducyrs*W_parity, agedays*W_feducyrs*W_perdiar24, agedays*W_feducyrs*W_mhtcm, agedays*W_feducyrs*W_fhtcm, agedays*W_feducyrs*a, agedays*W_parity*W_mhtcm, agedays*W_parity*W_fhtcm, agedays*W_perdiar24*W_fhtcm, W_mage*W_fage*W_mhtcm, W_fage*W_mhtcm*W_fhtcm, agedays*month*hdlvry, agedays*month*W_fage, agedays*month*W_nhh, agedays*month*W_parity, agedays*month*W_fhtcm, agedays*brthmon*W_parity, agedays*brthmon*W_mhtcm, agedays*W_mage*W_parity, agedays*W_fage*W_nhh, agedays*W_fage*W_mhtcm, agedays*W_fage*a, agedays*W_meducyrs*W_nhh, agedays*W_nhh*W_mhtcm, agedays*W_nhh*W_fhtcm, agedays*W_mhtcm*W_fhtcm, agedays*W_mhtcm*a

(Continues)

TABLE A1 (Continued)

Study ID	AllCovariates	IncludedCovariates
2	sex, month, brthmon, hfoodsec, enstunt, agedays, W_meducyrs, W_nhh, W_mage, W_mhtcm, W_mwtkg, W_mbmi, enwast, impsan, W_feducyrs, W_parity, delta_W_mage, delta_W_mhtcm, delta_W_mwtkg, delta_W_mbmi, delta_enwast, delta_impsan, delta_W_feducyrs, delta_W_parity, a	sex*agedays, month*agedays, month*W_mhtcm, brthmon*agedays, brthmon*W_meducyrs, hfoodsec*agedays, hfoodsec*W_mage, enstunt*agedays, enstunt*W_mhtcm, enstunt*W_mwtkg, enstunt*W_feducyrs, agedays*W_meducyrs, agedays*W_nhh, agedays*W_mage, agedays*W_mhtcm, agedays*W_mwtkg, agedays*W_mbmi, agedays*enwast, agedays*impsan, agedays*W_feducyrs, agedays*W_parity, agedays*delta_W_mage, agedays*delta_W_mhtcm, agedays*delta_W_mwtkg, agedays*delta_W_mbmi, agedays*delta_enwast, agedays*delta_impsan, agedays*delta_W_feducyrs, agedays*delta_W_parity, agedays*a, W_meducyrs*W_mhtcm, W_meducyrs*W_parity, W_mage*W_mwtkg, W_mage*a, W_mhtcm*W_mwtkg, W_mhtcm*W_mbmi, W_mhtcm*enwast, W_mwtkg*enwast, W_mwtkg*W_feducyrs, agedays, sex*W_mage, sex*W_mhtcm, month*W_nhh, month*W_mage, month*W_mwtkg, month*W_feducyrs, brthmon*W_nhh, brthmon*W_mage, brthmon*W_mhtcm, brthmon*W_mwtkg, brthmon*W_feducyrs, hfoodsec*W_meducyrs, hfoodsec*W_mwtkg, W_meducyrs*W_mage, W_meducyrs*W_mwtkg, W_meducyrs*W_feducyrs, W_nhh*W_mage, W_nhh*W_mhtcm, W_nhh*W_mwtkg, W_nhh*W_feducyrs, W_mage*W_mhtcm, W_mhtcm*W_feducyrs, W_mhtcm*W_parity, W_mwtkg*W_mbmi, W_mwtkg*W_parity, W_mbmi*W_feducyrs
3	agedays, sex, month, brthmon, enstunt, enwast, cleanck, impfloor, W_mage, W_mhtcm, W_meducyrs, W_nhh, impsan, delta_cleanck, delta_impfloor, delta_W_mage, delta_W_mhtcm, delta_W_meducyrs, delta_W_nhh, delta_impsan, a	agedays*sex, agedays*month, agedays*brthmon, agedays*enstunt, agedays*enwast, agedays*cleanck, agedays*impfloor, agedays*W_mage, agedays*W_mhtcm, agedays*W_meducyrs, agedays*W_nhh, agedays*impsan, agedays*delta_cleanck, agedays*delta_W_nhh, agedays*delta_impsan, agedays*a, month*W_mhtcm, brthmon*W_mhtcm, enstunt*W_mage, enstunt*W_mhtcm, impfloor*W_mhtcm, W_mage*W_mhtcm, W_mhtcm*W_meducyrs, W_mhtcm*W_nhh, W_mhtcm*impsan, W_mhtcm*delta_W_mage, W_mhtcm*delta_W_mhtcm, W_nhh*a, agedays, agedays*delta_impfloor, agedays*delta_W_mage, agedays*delta_W_mhtcm, agedays*delta_W_meducyrs, month*W_mage, month*W_meducyrs, month*W_nhh, brthmon*W_mage, brthmon*W_nhh, W_mage*W_meducyrs, W_mage*W_nhh, W_meducyrs*W_nhh
4	agedays, sex, month, brthmon, enstunt, single, W_gagebrth, W_mage, W_meducyrs, W_feducyrs, W_parity, hhwealth_quart, enwast, vagbrth, hdlvry, earlybf, hfoodsec, W_birthwt, W_mhtcm, W_mwtkg, W_mbmi, W_fage, impsan, delta_enwast, delta_vagbrth, delta_hdlvry, delta_earlybf, delta_hfoodsec, delta_W_birthwt, delta_W_mhtcm, delta_W_mwtkg, delta_W_mbmi, delta_W_fage, delta_impsan, a	agedays*sex, agedays*brthmon, agedays*enstunt, agedays*W_gagebrth, agedays*W_birthwt, agedays*W_mhtcm, agedays*W_fage, agedays*delta_hdlvry, agedays*delta_hfoodsec, agedays*a, sex*W_birthwt, brthmon*W_birthwt, enstunt*W_birthwt, single*W_birthwt, W_gagebrth*W_birthwt, W_gagebrth*W_mwtkg, W_mage*W_birthwt, W_meducyrs*W_birthwt, W_feducyrs*W_birthwt, W_parity*W_birthwt, hhwealth_quart*W_birthwt, enwast*W_birthwt, vagbrth*W_birthwt, hdlvry*W_birthwt, earlybf*W_birthwt, hfoodsec*W_birthwt, W_birthwt*W_mhtcm, W_birthwt*W_mbmi, W_birthwt*W_fage, W_birthwt*impsan, W_birthwt*delta_enwast, W_birthwt*delta_hdlvry, W_birthwt*delta_earlybf, W_birthwt*delta_W_birthwt, agedays*month, agedays*W_mage, agedays*W_meducyrs, agedays*W_feducyrs, agedays*W_parity, agedays*hhwealth_quart, agedays*hfoodsec, agedays*W_mwtkg, agedays*W_mbmi, month*W_birthwt, W_birthwt*W_mwtkg, W_birthwt*delta_hfoodsec, W_birthwt*delta_W_fage

(Continues)

TABLE A1 (Continued)

Study ID	AllCovariates	IncludedCovariates
5	agedays, sex, month, brthmon, enstunt, anywast06, enwast, vagbrth, hdlvry, single, nchldlt5, hhwealth_quart, pers_wast, W_gagebrth, W_birthwt, W_mage, W_mhtcm, W_mwtkg, W_mbmi, W_meducyrs, W_feducyrs, W_nchldlt5, W_parity, delta_enwast, delta_vagbrth, delta_hdlvry, delta_single, delta_nchldlt5, delta_hhwealth_quart, delta_pers_wast, delta_W_gagebrth, delta_W_birthwt, delta_W_mage, delta_W_mhtcm, delta_W_mwtkg, delta_W_mbmi, delta_W_meducyrs, delta_W_feducyrs, delta_W_nchldlt5, delta_W_parity, a	agedays*W_gagebrth, agedays*W_birthwt, agedays*W_mhtcm, agedays*W_meducyrs, sex*W_birthwt, brthmon*W_birthwt, enstunt*W_birthwt, anywast06*W_birthwt, enwast*W_birthwt, vagbrth*W_birthwt, nchldlt5*W_birthwt, hhwealth_quart*W_birthwt, pers_wast*W_birthwt, W_gagebrth*W_birthwt, W_birthwt*W_mage, W_birthwt*W_mhtcm, W_birthwt*W_mwtkg, W_birthwt*W_meducyrs, W_birthwt*W_feducyrs, W_birthwt*W_nchldlt5, W_birthwt*W_parity, W_birthwt*delta_hdlvry, W_birthwt*delta_single, W_birthwt*delta_pers_wast, W_birthwt*delta_W_birthwt, W_birthwt*delta_W_mage, W_birthwt*delta_W_parity, W_birthwt*a, agedays*month, agedays*brthmon, agedays*W_mage, agedays*W_mwtkg, agedays*W_mbmi, agedays*W_feducyrs, month*W_birthwt, W_gagebrth*W_mhtcm, W_birthwt*W_mbmi, W_birthwt*delta_W_gagebrth
6	agedays, sex, month, brthmon, enstunt, enwast, W_mage, W_mhtcm, W_mwtkg, W_mbmi, W_nchldlt5, delta_W_mage, delta_W_mhtcm, delta_W_mwtkg, delta_W_mbmi, delta_W_nchldlt5, a	agedays*W_mage, agedays*W_mhtcm, agedays*W_mbmi, W_mhtcm*W_mwtkg, agedays*sex*month, agedays*sex*brthmon, agedays*sex*W_mage, agedays*sex*W_mhtcm, agedays*month*brthmon, agedays*month*enstunt, agedays*month*W_mage, agedays*month*W_mhtcm, agedays*month*W_mwtkg, agedays*month*W_mbmi, agedays*month*W_nchldlt5, agedays*month*delta_W_nchldlt5, agedays*brthmon*enstunt, agedays*brthmon*W_mage, agedays*brthmon*W_mhtcm, agedays*brthmon*W_mwtkg, agedays*brthmon*W_mbmi, agedays*brthmon*W_nchldlt5, agedays*brthmon*delta_W_mhtcm, agedays*brthmon*a, agedays*enstunt*W_mage, agedays*enstunt*W_mhtcm, agedays*enstunt*W_mwtkg, agedays*enstunt*W_mbmi, agedays*enstunt*W_nchldlt5, agedays*enstunt*a, agedays*enwast*W_mhtcm, agedays*enwast*W_mwtkg, agedays*enwast*a, agedays*W_mage*W_mhtcm, agedays*W_mage*W_mwtkg, agedays*W_mage*W_mbmi, agedays*W_mage*a, agedays*W_mhtcm*W_mwtkg, agedays*W_mhtcm*W_mbmi, agedays*W_mhtcm*W_nchldlt5, agedays*W_mhtcm*delta_W_mage, agedays*W_mhtcm*delta_W_mhtcm, agedays*W_mhtcm*delta_W_mwtkg, agedays*W_mhtcm*delta_W_mbmi, agedays*W_mhtcm*delta_W_nchldlt5, agedays*W_mhtcm*a, agedays*W_mwtkg*W_mbmi, agedays*W_mwtkg*W_nchldlt5, agedays*W_mwtkg*delta_W_mage, agedays*W_mwtkg*delta_W_mhtcm, agedays*W_mwtkg*delta_W_mwtkg, agedays*W_mwtkg*delta_W_mbmi, agedays*W_mwtkg*delta_W_nchldlt5, agedays*W_mbmi*W_nchldlt5, agedays*W_nchldlt5*a, sex*brthmon*W_mhtcm, sex*W_mage*W_mwtkg, month*W_mage*W_mhtcm, month*W_mhtcm*W_mwtkg, brthmon*enstunt*W_mhtcm, brthmon*W_mage*W_mhtcm, brthmon*W_mage*W_mwtkg, brthmon*W_mhtcm*W_mwtkg, enstunt*W_mage*W_mhtcm, enstunt*W_mhtcm*W_mwtkg, enwast*W_mage*W_mhtcm, enwast*W_mhtcm*W_mwtkg, W_mage*W_mhtcm*W_mwtkg, W_mage*W_mhtcm*W_nchldlt5, W_mage*W_mwtkg*W_mbmi, W_mhtcm*W_mwtkg*W_mbmi,

(Continues)

TABLE A1 (Continued)

Study ID	AllCovariates	IncludedCovariates
		W_mhtcm*W_mwtkg*W_nchldlt5, agedays*W_mwtkg, agedays*sex*enwast, agedays*sex*W_mwtkg, agedays*sex*W_mbmi, agedays*sex*W_nchldlt5, agedays*month*enwast, agedays*month*delta_W_mage, agedays*month*delta_W_mhtcm, agedays*month*delta_W_mwtkg, agedays*month*delta_W_mbmi, agedays*month*a, agedays*brthmon*enwast, agedays*enwast*W_mage, agedays*enwast*W_mbmi, agedays*enwast*W_nchldlt5, agedays*W_mage*W_nchldlt5, agedays*W_mwtkg*a, sex*W_mhtcm*W_mwtkg, month*brthmon*W_mwtkg, month*W_mage*W_mwtkg, month*W_mage*W_mbmi, month*W_mwtkg*W_mbmi, brthmon*W_mwtkg*W_mbmi, W_mage*W_mhtcm*W_mbmi, W_mage*W_mwtkg*W_nchldlt5
7	agedays, sex, month, brthmon, enstunt, enwast, single, cleanck, hfoodsec, W_mage, W_mhtcm, W_mwtkg, hhwealth_quart, safeh20, W_mbmi, W_fage, W_meducyrs, W_feducyrs, W_nrooms, W_nchldlt5, impsan, delta_single, delta_cleanck, delta_hfoodsec, delta_W_mage, delta_W_mhtcm, delta_W_mwtkg, delta_hhwealth_quart, delta_safeh20, delta_W_mbmi, delta_W_fage, delta_W_meducyrs, delta_W_feducyrs, delta_W_nrooms, delta_W_nchldlt5, delta_impsan, a	agedays*sex, agedays*month, agedays*brthmon, agedays*enstunt, agedays*enwast, agedays*single, agedays*cleanck, agedays*hfoodsec, agedays*W_mage, agedays*W_mhtcm, agedays*W_mwtkg, agedays*hhwealth_quart, agedays*W_mbmi, agedays*W_fage, agedays*W_meducyrs, agedays*W_feducyrs, agedays*W_nrooms, agedays*W_nchldlt5, agedays*impsan, agedays*delta_single, agedays*delta_cleanck, agedays*delta_hfoodsec, agedays*delta_W_mage, agedays*delta_W_mhtcm, agedays*delta_W_mwtkg, agedays*delta_hhwealth_quart, agedays*delta_safeh20, agedays*delta_W_mbmi, agedays*delta_W_fage, agedays*delta_W_meducyrs, agedays*delta_W_feducyrs, agedays*delta_W_nrooms, agedays*delta_W_nchldlt5, agedays*delta_impsan, agedays*a, sex*month, month*single, month*W_mhtcm, month*W_mwtkg, month*hhwealth_quart, brthmon*enstunt, brthmon*W_mwtkg, brthmon*safeh20, brthmon*W_fage, brthmon*W_feducyrs, brthmon*W_nrooms, brthmon*W_nchldlt5, enstunt*W_mhtcm, enstunt*W_mbmi, enstunt*W_fage, enstunt*W_feducyrs, single*W_mhtcm, hfoodsec*W_mhtcm, hfoodsec*hhwealth_quart, hfoodsec*W_meducyrs, W_mage*W_mhtcm, W_mage*W_mwtkg, W_mage*hhwealth_quart, W_mage*W_fage, W_mage*W_meducyrs, W_mage*W_nchldlt5, W_mage*delta_W_nrooms, W_mhtcm*W_mwtkg, W_mhtcm*hhwealth_quart, W_mhtcm*W_mbmi, W_mhtcm*W_fage, W_mhtcm*W_nrooms, W_mhtcm*W_nchldlt5, W_mhtcm*delta_impsan, W_mwtkg*hhwealth_quart, W_mwtkg*W_fage, W_mwtkg*W_meducyrs, W_mwtkg*W_feducyrs, W_mwtkg*W_nchldlt5, W_mwtkg*impsan, W_mwtkg*delta_W_nrooms, W_mwtkg*delta_W_nchldlt5, W_mwtkg*a, W_fage*W_feducyrs, W_fage*W_nrooms, W_meducyrs*W_nrooms, W_meducyrs*W_nchldlt5, W_feducyrs*delta_W_nrooms, W_feducyrs*a, agedays, agedays*safeh20, sex*W_mwtkg, sex*W_fage, month*brthmon, month*W_mage, month*W_mbmi, month*W_fage, month*W_meducyrs, month*W_feducyrs, month*W_nrooms, brthmon*hfoodsec, brthmon*W_mage, brthmon*W_mhtcm, brthmon*W_mbmi, brthmon*W_meducyrs, enstunt*W_mage, enstunt*W_mwtkg, enwast*W_mage, single*W_mage, single*W_mwtkg, hfoodsec*W_mage, hfoodsec*W_mwtkg, hfoodsec*W_fage, W_mage*W_mbmi, W_mage*W_feducyrs, W_mage*W_nrooms, W_mhtcm*W_meducyrs, W_mhtcm*W_feducyrs, W_mwtkg*W_mbmi, W_mwtkg*W_nrooms, W_mwtkg*delta_impsan, hhwealth_quart*W_fage, hhwealth_quart*W_meducyrs, hhwealth_quart*W_feducyrs, W_mbmi*W_fage, W_mbmi*W_meducyrs, W_fage*W_meducyrs, W_fage*W_nchldlt5, W_meducyrs*W_feducyrs, W_feducyrs*W_nchldlt5

(Continues)

TABLE A1 (Continued)

Study ID	AllCovariates	IncludedCovariates
8	agedays, sex, month, brthmon, enstunt, enwast, W_mage, W_mhtcm, W_mwtkg, W_mbmi, W_meducyrs, W_feducyrs, W_nchldlt5, W_nhh, impsan, hhwealth_quart, safeh20, delta_W_mage, delta_W_mhtcm, delta_W_mwtkg, delta_W_mbmi, delta_W_meducyrs, delta_W_feducyrs, delta_W_nchldlt5, delta_W_nhh, delta_impsan, delta_hhwealth_quart, delta_safeh20, a	agedays*sex, agedays*month, agedays*brthmon, agedays*enstunt, agedays*enwast, agedays*W_mage, agedays*W_mhtcm, agedays*W_mbmi, agedays*W_meducyrs, agedays*W_feducyrs, agedays*W_nchldlt5, agedays*W_nhh, agedays*hhwealth_quart, agedays*delta_W_mage, agedays*delta_W_feducyrs, agedays*delta_W_nchldlt5, W_mage*W_feducyrs, W_mhtcm*W_mwtkg, agedays*W_mwtkg, agedays*safeh20, agedays*a
9	agedays, sex, month, brthmon, enstunt, W_parity, vagbrth, impfloor, earlybf, hfoodsec, enwast, hhwealth_quart, safeh20, W_gagebrth, W_birthwt, W_birthlen, W_mage, W_mhtcm, W_nrooms, W_meducyrs, W_feducyrs, W_nchldlt5, impsan, delta_vagbrth, delta_impfloor, delta_earlybf, delta_hfoodsec, delta_enwast, delta_hhwealth_quart, delta_safeh20, delta_W_gagebrth, delta_W_birthwt, delta_W_birthlen, delta_W_mage, delta_W_mhtcm, delta_W_nrooms, delta_W_meducyrs, delta_W_feducyrs, delta_W_nchldlt5, delta_impsan, a	agedays*month, agedays*brthmon, agedays*enstunt, agedays*W_parity, agedays*earlybf, agedays*enwast, agedays*W_gagebrth, agedays*W_birthwt, agedays*W_birthlen, agedays*W_mage, agedays*W_mhtcm, agedays*W_nrooms, agedays*W_meducyrs, agedays*W_feducyrs, agedays*W_nchldlt5, agedays*impsan, agedays*delta_enwast, agedays*delta_W_gagebrth, agedays*delta_W_birthwt, agedays*delta_W_meducyrs, sex*W_birthwt, month*W_birthwt, brthmon*W_birthwt, enstunt*W_birthwt, W_parity*W_birthwt, vagbrth*W_birthwt, impfloor*W_birthwt, earlybf*W_birthwt, hfoodsec*W_birthwt, enwast*W_birthwt, hhwealth_quart*W_birthwt, safeh20*W_birthwt, W_gagebrth*W_birthwt, W_gagebrth*W_birthlen, W_gagebrth*W_mage, W_gagebrth*W_mhtcm, W_birthwt*W_birthlen, W_birthwt*W_mage, W_birthwt*W_mhtcm, W_birthwt*W_nrooms, W_birthwt*W_meducyrs, W_birthwt*W_feducyrs, W_birthwt*W_nchldlt5, W_birthwt*delta_vagbrth, W_birthwt*delta_hfoodsec, W_birthwt*delta_enwast, W_birthwt*delta_W_birthlen, W_birthwt*delta_W_feducyrs, W_birthwt*delta_impsan, W_birthwt*a, W_mhtcm*W_meducyrs, W_birthwt, agedays*sex, agedays*impfloor, agedays*hfoodsec, agedays*hhwealth_quart, agedays*delta_impfloor, agedays*delta_earlybf, agedays*delta_hfoodsec, agedays*delta_hhwealth_quart, agedays*delta_W_birthlen, agedays*delta_W_mhtcm, agedays*delta_W_feducyrs, agedays*a, month*W_gagebrth, brthmon*W_gagebrth, W_gagebrth*W_meducyrs, W_gagebrth*W_feducyrs, W_birthwt*impsan, W_birthwt*delta_earlybf, W_birthwt*delta_W_gagebrth, W_birthwt*delta_W_mhtcm, W_birthwt*delta_W_meducyrs, W_mage*W_feducyrs, W_mhtcm*W_feducyrs
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APPENDIX B. SUPPLEMENTAL INFORMATION ON STUDIES

B.1 iLiNS-Zinc

The iLiNS Zinc intervention was a placebo-controlled, cluster-randomized trial that enrolled children in Burkina Faso.[86] Data used in this analysis was collected between 2010 and 2012 from 3265 children in rural southwestern Burkina Faso. The objective of this study was to compare the effect of providing small-quantity lipid-based nutrient supplements (SQ-LNS) with varying amounts of zinc, along with illness treatment, to standard care on zinc-related outcomes. The outcome measure used here was a height-to-age z-score for children. For the purposes of this analysis, the treatment arms were split into a control group (placebo) and a treatment group (zinc supplementation or SQ-LNS with varying amounts of zinc).

B.2 iLiNS-DOSE

The iLiNS-DOSE intervention was a randomized, controlled, single-blind, parallel-group clinical trial that enrolled healthy infants between 5.5 and 6.5 months of age in Malawi.[87] Data used in this analysis was collected between 2009 and 2011 for 1,931 children in rural Malawi. The objective of this trial was to identify the lowest growth-promoting daily dose of modified lipid-based nutrient supplements. The outcome measure used here was the children's height-to-age z-score. For the purposes of this analysis, treatment arms were split into a control group (no supplement during primary follow-up period with delayed supplementation from 18 to 30 months) and a treatment group consisting of multiple interventions (varying doses of milk-containing LNSs or milk-free LNSs between 6 and 18 months of age).

B.3 JiVitA-3: Impact of antenatal multiple micronutrient supplementation on infant mortality

The JiVitA-3 intervention was a cluster-randomized, double-masked trial that enrolled pregnant women from rural Bangladesh;[88] data used in this analysis was collected between 2008 and 2012. The objective of this trial was to compare the effects of daily maternal multiple micronutrient versus iron and folic acid supplementation on 6-month infant mortality and adverse birth outcomes. The outcome measure used here was a height-to-age z-score for infants. Treatment arms were split into a control group (folic acid and iron supplementation only) and a treatment group (supplement containing 15 essential vitamins and minerals).

B.4 JiVitA-4: Effect of fortified complementary food supplementation on child growth in rural Bangladesh

The JiViTa-4 intervention was an unblinded, cluster-randomized, controlled trial that enrolled children at 6 months of age and provided daily supplements for a year.[89] Data used in this analysis was collected between 2012 and 2014 for 5443 children in rural Bangladesh. The objective of this trial was to compare the effects of three specially formulated complementary food supplements and an international product, Plumpy'doz, with a control (no food supplement) on children's growth outcomes. The outcome measure used here was a height-to-age z-score for children. For the purposes of this analysis, treatment arms were split into a control (nutrition counseling only) and a treatment group (food supplements with nutrition counseling).

B.5 WASH benefits Bangladesh

The WASH benefits Bangladesh intervention was a cluster randomized trial that enrolled pregnant women from villages in rural Bangladesh;[84] data used in this analysis was collected between 2012 and 2015 for 4863 children. The outcome measure used here was a height-to-age z-score for children. For the purposes of this analysis, treatment arms were split into a control group (data collection only) and a treatment group. This treatment group consists of multiple interventions: chlorinated drinking water; upgraded sanitation; promotion of handwashing with soap; combination of water, sanitation, and handwashing; child nutrition counseling plus lipid-based supplements; and a combination of water, sanitation, handwashing, and nutrition.

B.6 WASH benefits Kenya

The WASH benefits Kenya intervention was a cluster randomized trial that enrolled pregnant women from western Kenya;[85] data used in this analysis was collected between 2013 and 2015 for 7399 children. The outcome measure used here was a height-to-age z-score for children. For the purposes of this analysis, treatment arms were split into a control group (no visits) and a treatment group. This treatment group consists of multiple interventions: chlorinated drinking water; improved sanitation; handwashing with soap; combined water, sanitation, and handwashing; nutrition counseling plus lipid-based supplements; and combined water, sanitation, handwashing, and nutrition.

B.7 SAS food supplementation

The SAS Food Supplementation intervention was a randomized trial that enrolled four-month-old infants in an urban slum in Delhi, India.[90] Data for this analysis was collected between 1995 and 1996 from 418 children. The objective of this study was to measure the effect of feeding a micronutrient-fortified food supplement to infants on physical growth between 4 and 12 months of age. The measured outcome used in this analysis was a height-to-age z-score for children. For the purposes of this analysis, treatment arms were split into a control group (no counseling or food supplements) and a treatment group consisting of multiple interventions (milk-based cereal and nutritional counseling, nutritional counseling alone, or visitation alone).

B.8 iLiNS-DYAD-M

The iLiNS-DYAD-M intervention was a randomized trial that enrolled infants 6 to 18 months of age in rural Malawi.[91] Data was collected between 2011 and 2015 from 1205 children. The objective of this study was to test whether small-quantity lipid-based nutrient supplements (SQ-LNS) would promote child growth with an outcome measure of the children's height-to-age z-score at 18 months. Treatment arms were split into a control group (iron and folate supplementation during pregnancy) and a treatment group with multiple interventions (multiple micronutrient tablets or small-quantity lipid-based nutrient supplements (SQ-LNS) during pregnancy and first 6 months of lactation). Children in the SQ-LNS group received SQ-LNSs from 6 to 18 months of age, while children in the control group and multiple-micronutrient tablet group did not receive any supplementation.

B.9 Tanzania child 2

The trial of zinc and micronutrients in Tanzanian children was a randomized 2×2 factorial, double-blind clinical trial.[92] Data used in this analysis was collected from 2396 children born to HIV-negative mothers in Tanzania. The secondary objective of this study was to determine whether daily administration of zinc or multivitamins from 6 weeks of age for 18 months would improve child growth; the measured outcome used in this analysis was the children's height-to-age z-score. For the purposes of this analysis, treatment arms were split into a control group (placebo) and a treatment group consisting of multiple interventions (zinc only, multivitamins only, or zinc, and multivitamins).

B.10 Lungwena child nutrition intervention

The Lungwena child nutrition intervention was a single-blind, parallel randomized trial that enrolled six-month-old healthy infants in the Lungwena area of the Mangochi District in rural Malawi.[93] Data for this analysis was collected between 2008 and 2014 from 840 children. The objective of this study was to determine whether lipid-based nutrient supplementation as a complementary food from 6 to 18 months of age led to lower incidence of severe stunting in infants. The measured outcome used in this analysis was a height-to-age z-score for children. For the purposes of this analysis, treatment arms were split into a control group (no extra food supplements) and a treatment group consisting of multiple interventions (milk-powder-containing LNS, soy-powder protein supplement, or maize-soy flour supplement).

APPENDIX C. SUPPLEMENTAL INFORMATION ON UNDERSMOOTHED HAL

With the assumption that the target parameter ψ falls in the Donsker class of all cadlag functions (right-hand continuous, with left-hand limits) with finite variation norm, we have the following representation:[94]

$$\psi(\mathbf{x}) = \psi(0) + \sum_{s \subset \{1,2,\dots,p\}} \int_{0_s}^{\mathbf{x}_s} \psi_s(du)$$

where $\mathbf{x} \in \mathbb{R}^p$ and s denotes the indices of sections of ψ. Then let us further denote $\mathbf{x}_s = (x_k : k \in s)$ as the subvector with support of s, and $\tilde{\mathbf{x}}_{s,i}$ as the values of the subvector for the ith observation. Now ψ can be approximated by ψ_m such that:[51]

$$\psi_m(\mathbf{x}) = \psi(0) + \sum_{s\subset\{1,2,\ldots,p\}} \sum_{i=1}^{n} I(\tilde{\mathbf{x}}_{s,i} \leq \mathbf{x}_s) d\psi_{m,s,i}$$

Now if we consider a model with the basis functions $\phi_{s,i} = I(\tilde{x}_{s,i} \leq x_s)$ as predictors and $d\psi_{m,s,i}$ as coefficients, we have:[51]

$$\psi_\beta = \beta_0 + \sum_{s\subset\{1,2,\ldots,p\}} \sum_{i=1}^{n} \beta_{s,i}\phi_{s,i}$$

By the assumption of finite sectional variation norm (an entropy assumption required of all but two of the estimators), cross-validated TMLE and double-robust EE) we have the corresponding subspace $\Psi_{n,M} = \{\psi_\beta : \beta_0 + \sum_{s\subset\{1,2,\ldots,p\}} \sum_{i=1}^{n} |\beta_{s,i}| < M\}$.[51]

In our study, we only use the undersmoothed HAL to generate data without prespecifying any parameter of interest. The stopping criterion for this undersmoothing process is to increase the initial bound C_{cv} until the score equations formed by the product of basis functions and residuals are solved at the rate of $\frac{\sigma_n}{\sqrt{n}\log(n)}$.[57] Namely, for all "nontrivial directions" (combinations of s, i with nonzero coefficients selected by the initial fit) we need:

$$|P_n\left(\phi_{s,i}(Y - \overline{Q}_{n,C})\right)| \leq \frac{\sigma_n}{\sqrt{n}\log(n)} \tag{C1}$$

where P_n is the empirical average function and $\sigma_n^2 = Var\left(\phi_{s,i}(Y - \overline{Q}_{n,C_{cv}})\right)$. Following the convention of notation in,[10] we define $\overline{Q}_0 = \mathbb{E}_{\mathbb{P}_0}(Y|A, W)$ and $\overline{Q}_n$ as its estimate. Also, we use $Q_{W,0} = \mathbb{P}_0(W)$, $Q_0 = (\overline{Q}_0, Q_{W,0})$, and Q denoting the possible value of true Q_0.

To justify this criterion, first fix (s, i) and consider the target parameter $\Psi_{s,i}(Q_0) = P_0(\phi_{s,i}\overline{Q}_0) = \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}\overline{Q}_0) = \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y)$. (Notice that for this target parameter, we can treat A as a member of W so that Q_0 actually contains $\overline{Q}_0$ and $Q_{W',0} = \mathbb{P}_0(A, W)$). The last equality is true since $\mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y) = \mathbb{E}_{\mathbb{P}_0}[\mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y|A, W)] = \mathbb{E}_{\mathbb{P}_0}[\phi_{s,i}\mathbb{E}_{\mathbb{P}_0}(Y|A, W)]$. We claim that $\phi_{s,i}(Y - \overline{Q}_0)$ is a component of the efficient influence curve (EIC) of $\Psi_{s,i}(Q_0)$, where we denote the EIC as $D^*_{s,i}(Q_0)$. To prove this, we can start with the empirical estimator $\frac{1}{n}\sum_{k=1}^{n}\phi_{s,i}y_k$. Observe that

$$\frac{1}{n}\sum_{k=1}^{n}\phi_{s,i}y_k - \Psi_{s,i}(Q_0) = \frac{1}{n}\sum_{k=1}^{n}(\phi_{s,i}y_k - \Psi_{s,i}(Q_0))$$

Thus the influence curve of the empirical estimator is $\phi_{s,i}Y - \Psi_{s,i}(Q_0)$, denote it as $D^0_{s,i}(Q_0)$. With it, we can obtain $D^*_{s,i}(Q_0)$ by projecting $D^0_{s,i}(Q_0)$ onto the tangent space $T(\mathbb{P}_0)$.[10] In addition, since $\mathbb{P}(O) = \mathbb{P}(Y, A, W) = \mathbb{P}(Y|A, W)\mathbb{P}(A, W)$, the tangent space $T(\mathbb{P}_0)$ can be decomposed as: $T(\mathbb{P}_0) = T_Q(\mathbb{P}_0) = T_{Q_Y}(\mathbb{P}_0) \oplus T_{Q_{A,W}}(\mathbb{P}_0)$.[10] So the projection of $D^0_{s,i}(Q_0)$ on $T(\mathbb{P}_0)$ is equal to the sum of the projections of $D^0_{s,i}(Q_0)$ on $T_{Q_Y}(\mathbb{P}_0)$ and $T_{Q_{A,W}}(\mathbb{P}_0)$, namely, $\sqcap(D^0_{s,i}(Q_0)|T(\mathbb{P}_0)) = \sqcap(D^0_{s,i}(Q_0)|T_{Q_Y}(\mathbb{P}_0)) + \sqcap(D^0_{s,i}(Q_0)|T_{Q_{A,W}}(\mathbb{P}_0))$. Thereby $D^*_{s,i}(Q_0) = \sqcap(D^0_{s,i}(Q_0)|T_{Q_Y}(\mathbb{P}_0)) + \sqcap(D^0_{s,i}(Q_0)|T_{Q_{A,W}}(\mathbb{P}_0))$. Then[10]

$$\begin{aligned}
\sqcap(D^0_{s,i}(Q_0)|T_{Q_Y}(\mathbb{P}_0)) &= D^0_{s,i}(Q_0) - \mathbb{E}_{\mathbb{P}_0}(D^0_{s,i}(Q_0)|A, W) \\
&= \phi_{s,i}Y - \Psi_{s,i}(Q_0) - \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y - \Psi_{s,i}(Q_0)|A, W) \\
&= \phi_{s,i}Y - \Psi_{s,i}(Q_0) - \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y|A, W) + \Psi_{s,i}(Q_0) \\
&= \phi_{s,i}(Y - \mathbb{E}_{\mathbb{P}_0}(Y|A, W)) \\
&= \phi_{s,i}(Y - \overline{Q}_0)
\end{aligned}$$

and

$$\begin{aligned}
\sqcap(D^0_{s,i}(Q_0)|T_{Q_{A,W}}(\mathbb{P}_0)) &= \mathbb{E}_{\mathbb{P}_0}(D^0_{s,i}(Q_0)|A, W) \\
&= \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y - \Psi_{s,i}(Q_0)|A, W) \\
&= \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y|A, W) - \Psi_{s,i}(Q_0).
\end{aligned}$$

So, $D^*_{s,i}(Q_0) = \phi_{s,i}(Y - \overline{Q}_0) + \mathbb{E}_{\mathbb{P}_0}(\phi_{s,i}Y|A, W) - \Psi_{s,i}(Q_0)$.

Now we have proved that $\phi_{s,i}(Y - \overline{Q}_0)$ is a component of $D^*_{s,i}(Q_0)$. Another observation from the calculation above is that $D^0_{s,i}(Q_0) = D^*_{s,i}(Q_0)$.

For different pairs of (s, i), each $D^*_{s,i}(Q_{n,C})$ corresponds with an EIC for a particular target parameter $\Psi_{s,i}(Q_0)$. For each plug-in estimator $\Psi_{s,i}(Q_{n,C})$ being asymptotically linear we want at minimal $P_n D^*_{s,i}(Q_{n,C}) = o_P(n^{-\frac{1}{2}})$ for every (s, i), which is guaranteed by our choice of criterion. By doing so, we will also be solving $P_n(\sum_{s,i} \alpha(s, i)\phi_{s,i})(Y - \overline{Q}_{n,C})$ for any α vector with finite L_1-norm, which enables us to approximate any function of (A, W) with rate approximately equal to $n^{-\frac{1}{3}}$.[55] So in this way we are rich enough to guarantee to solve any EIC that can be written as $f(A, W)(Y - \overline{Q}_0)$, thereby cover all EIC of features of Q. So the undersmoothing process essentially yields an estimator that is efficient for any target feature of Q that is pathwise differentiable. Combined with the fact that when the bias of an estimator is smaller than $\frac{se}{\max(10, \log n)}$ then it has minimal impact on coverage, we choose (1) as the stopping criterion based on the proof above.