Supplemental Online Materials – Tables for all main and interaction effects with for “A Viable Alternative when Propensity Scores Fail: Evaluation of Inverse Propensity Weighting and Sequential G-estimation in a Two-Wave Mediation Model” under review at *Multivariate Behavioral Research.*

**Sampling Variability**

Significant predictors of sampling variability of the IPW estimators and the Sequential G-estimator can be found in Table S1.

--------- Insert Table S1 about here ---------

**Relative Bias**

The significant predictors of the relative bias of the IPW estimators and sequential G-estimator are presented in Table S2. Because of the large sampling variability of the IPW estimators, semi-partial *η2* values greater than or equal to 0.001 (rather than 0.01) were used as the significance criterion for relative bias.

--------- Insert Table S2 about here ---------

**Mean Squared Error**

The significant predictors of MSE of the IPW estimators and sequential G-estimator are presented in Table S3

--------- Insert Table S3 about here --------

**Type 1 Error Rates – *b* path equal to zero**

Significant predictors of Type 1 error rates when the *b* path was equal to zero and the *a* path varied for the IPW estimators and sequential G-estimator can be found in Table S4

--------- Insert Table S4 about here ---------

**Confidence Interval Coverage**

The significant predictors of the 95% confidence interval coverage of the IPW estimators and sequential G-estimator are presented in Table S5.

--------- Insert Table S5 about here ---------

**Type 1 Error and Power for Controlled Direct Effect**

In the main manuscript sequential G-estimation was used to estimate the mediated effect by first estimating the controlled direct effect (CDE) and then subtracting this quantity from the total effect. Recall, the steps of sequential G-estimation are:

1. Regress *Y2* on the intervention (*X*), follow-up mediator (*M2*), and baseline measures of the mediator and outcome (*M1* and *Y1*), as shown in Equation 6 in the main body of the manuscript
2. Save the estimated regression coefficient relating *M2* to *Y2* from Equation 6 (*by2m2*) in the main body of the manuscript.
3. For each participant, subtract the quantity *by2m2M2* from their observed value of *Y2*. That is, compute *Y2diff* = *Y2* – *by2m2M2* for each participant.
4. Regress this residualized outcome variable, *Y2diff*, onto the randomized intervention variable, *X,* to estimate the adjusted direct effect (i.e., *c’y2x(adjusted)*). This is the G-estimate of the CDE of the randomized intervention on the follow-up outcome.

In Step 4, it is possible to regress *Y2diff* on the randomized intervention variable, *X*, and the baseline measures of the mediator and outcome, *M1* and *Y1* for an alternative estimate of the CDE (CDE\_alt). Because *X* represents a randomized intervention, the inclusion of the baseline measures of the mediator and outcome can be included in Step 4 to increase the statistical power to detect the CDE. It is possible to compare the Type 1error rates and the power to detect the CDE by seeing how the CDE and CDE\_alt estimators compared in the simulation study that was presented in the main body of the manuscript. The simulation contained two effect sizes of the direct effect (*c’y2x*) zero and medium (0 and 0.39).

--------- Insert Table S6 about here ---------

Table S6 summarizes the Type 1 error rates of the CDE and CDE\_alt estimators for each combination of simulation factor. The Type 1 error rates of the two estimators were very similar and did not exceed either the lower or upper bound of the robustness interval (i.e., they were within [0.025, 0.075]).

--------- Insert Table S7 about here ---------

Table S7 summarizes the power to detect the CDE and CDE\_alt for each combination of simulation factors. As expected, CDE\_alt had higher statistical power overall compared to the CDE estimator. There was little discrepancy between the power to between the CDE and the CDE\_alt estimator when stability = 0.30 and when the *Y2* cross-lag = 0. When stability = 0.70 the power of the CDE\_alt estimator was higher than the power of the CDE estimator. When *Y2* cross-lag = 0.50 the power of the CDE\_alt estimator was higher than the power of the CDE estimator.When stability = 0.70, *Y2* cross-lag = 0.50, and baseline correlation = 0.50 the discrepancy between the power of the CDE\_alt estimator and CDE estimator was the largest. The power of the CDE estimator and the CDE\_alt estimator was approximately equal for *M2* cross-lag = 0 and *M2* cross-lag = 0.50. Overall, the discrepancy in power to detect the CDE estimator and the CDE\_alt estimator was primarily a function of the strength of the predictors of *Y2*.

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| Table S1 | | | | | |
| *Semi-partial η2 for Predictors of Sampling Variability* | | | | | |
| Effect Type/Variables | IPW | IPW -Truncated 99% | IPW – Truncated 95% | IPW – Truncated 90% | Sequential G |
| **Main Effects** |  |  |  |  |  |
| Stability | **0.43** | **0.19** | **0.12** | **0.10** | **0.01** |
| Mediated Effect | **0.02** | **0.02** | **0.07** | **0.09** | **0.21** |
| Baseline Correlation | **0.04** | **0.02** | **0.01** | **0.01** | <0.01 |
| *M2* lag | **0.09** | **0.04** | **0.03** | **0.02** | <0.01 |
| *Y2* lag | **0.10** | **0.04** | **0.03** | **0.04** | <0.01 |
| Nobs | **0.18** | **0.40** | **0.41** | **0.38** | **0.32** |
|  |  |  |  |  |  |
| **Two-way interactions** |  |  |  |  |  |
| Mediated Effect X Nobs | <0.01 | <0.01 | **0.01** | **0.02** | **0.04** |
| Baseline Correlation X Stability | **0.01** | <0.01 | <0.01 | <0.01 | <0.01 |
| Baseline Correlation X *Y2* lag | **0.01** | <0.01 | <0.01 | <0.01 | <0.01 |
| Nobs X Stability | <0.01 | **0.04** | **0.02** | **0.02** |  |
| Nobs X *M2* lag | <0.01 | **0.01** | <0.01 | <0.01 | <0.01 |
| Nobs X *Y2* lag | <0.01 | **0.01** | **0.01** | <0.01 | <0.01 |
| Stability X *Y2* lag | **0.02** | **0.01** | <0.01 | <0.01 | <0.01 |
| *Note.* Main effects and Interactions included in the table are all the effects with semi-partial *η*2 0.01 for at least one of the IPW estimators or Sequential G-estimator. All semi-partial *η*2  0.01 are bolded and underlined. | | | | | |

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| Table S2 | | | | | |
| *Semi-partial η2 for Predictors of Relative Bias* | | | | | |
| Effect Type/Variables | IPW | IPW -Truncated 99% | IPW – Truncated 95% | IPW – Truncated 90% | Sequential G |
| **Main Effects** |  |  |  |  |  |
| Stability | **0.004** | **0.009** | **0.028** | **0.039** | <0.001 |
| Mediated Effect | **0.001** | **0.004** | **0.020** | **0.035** | <0.001 |
| Baseline Correlation | **0.001** | **0.002** | **0.009** | **0.014** | <0.001 |
| *M2* lag | **0.002** | **0.003** | **0.010** | **0.014** | <0.001 |
| *Y2* lag | **0.002** | **0.006** | **0.034** | **0.059** | <0.001 |
| Nobs | **0.001** | <0.001 | <0.001 | <0.001 | <0.001 |
|  |  |  |  |  |  |
| **Two-way interactions** |  |  |  |  |  |
| Mediated Effect X Baseline Correlation | <0.001 | <0.001 | **0.002** | **0.002** | <0.001 |
| Mediated Effect X Stability | **0.001** | **0.001** | **0.005** | **0.006** | <0.001 |
| Mediated Effect X *M2* lag | <0.001 | **0.001** | **0.002** | **0.002** | <0.001 |
| Mediated Effect X *Y2* lag | <0.001 | **0.001** | **0.006** | **0.010** | <0.001 |
| Baseline Correlation X Stability | <0.001 | **0.001** | **0.003** | **0.004** | <0.001 |
| Stability X *M2* lag | <0.001 | <0.001 | **0.001** | **0.001** | <0.001 |
| Stability X *Y2* lag | **0.001** | **0.002** | **0.005** | **0.007** | <0.001 |
|  |  |  |  |  |  |
| **Three-way interactions** |  |  |  |  |  |
| Mediated Effect X Stability X *Y2* lag | <0.001 | <0.001 | **0.001** | **0.001** | <0.001 |
| Mediated Effect X Stability X Baseline Correlation | <0.001 | <0.001 | <0.001 | **0.001** | <0.001 |
| *Note.* Main effects and Interactions included in the table are all the effects with semi-partial *η*2 0.001 for at least one of the IPW estimators or Sequential G-estimator. All semi-partial *η*2 0.001 are bolded and underlined. | | | | | |

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| Table S3 | | | | | |
| *Semi-partial η2 for Predictors of MSE* | | | | | |
| Effect Type/Variables | IPW | IPW -Truncated 99% | IPW – Truncated 95% | IPW – Truncated 90% | Sequential G |
| **Main Effects** |  |  |  |  |  |
| Stability | **0.10** | **0.07** | **0.07** | **0.07** | **0.01** |
| Mediated Effect | **0.01** | **0.01** | **0.05** | **0.06** | **0.09** |
| Baseline Correlation | **0.02** | **0.01** | **0.01** | **0.02** | <0.01 |
| *M2* lag | **0.02** | **0.01** | **0.02** | **0.02** | <0.01 |
| *Y2* lag | **0.03** | **0.02** | **0.04** | **0.05** | <0.01 |
| Nobs | **0.04** | **0.09** | **0.07** | **0.05** | **0.11** |
|  |  |  |  |  |  |
| **Two-way interactions** |  |  |  |  |  |
| Mediated Effect X Stability | <0.01 | <0.01 | **0.01** | **0.02** | <0.01 |
| Mediated Effect X *Y2* lag | <0.01 | <0.01 | **0.01** | **0.01** | <0.01 |
| Mediated Effect X Nobs | <0.01 | <0.01 | **0.01** | **0.01** | **0.04** |
| Baseline Correlation X Stability | **0.01** | <0.01 | **0.01** | **0.01** | <0.01 |
| Baseline Correlation X *Y2* lag | **0.01** | <0.01 | <0.01 | <0.01 | <0.01 |
| Stability X *Y2* lag | **0.01** | **0.01** | **0.01** | **0.02** | <0.01 |
| Nobs X Stability | **0.01** | **0.02** | **0.01** | **0.01** | <0.01 |
| Nobs X *Y2* lag | <0.01 | **0.01** | <0.01 | <0.01 | <0.01 |
|  |  |  |  |  |  |
| **Three-way interactions** |  |  |  |  |  |
| Mediated Effect X Stability X *Y2* lag | <0.01 | <0.01 | <0.01 | **0.01** | <0.01 |
| *Note.* Main effects and Interactions included in the table are all the effects with semi-partial *η*2 0.01 for at least one of the IPW estimators or Sequential G-estimator. All semi-partial *η*2 0.01 are bolded and underlined. | | | | | |

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| Table S4 | | | | | |
| *Semi-partial η2 for Predictors of Type 1 Error Rates when the b Path is Equal to Zero* | | | | | |
| Effect Type/Variables | IPW | IPW-Truncated 99% | IPW – Truncated 95% | IPW – Truncated 90% | Sequential G |
| **Main Effects** |  |  |  |  |  |
| Stability | **0.01** | **0.01** | **0.02** | **0.02** | < 0.01 |
| *a* path | **0.01** | **0.03** | **0.12** | **0.18** | **0.01** |
| Baseline Correlation | < 0.01 | < 0.01 | **0.01** | **0.01** | < 0.01 |
| *M2* lag | < 0.01 | **0.01** | **0.01** | **0.01** | < 0.01 |
| *Y2* lag | < 0.01 | **0.01** | **0.04** | **0.06** | < 0.01 |
| Nobs | < 0.01 | **0.01** | **0.07** | **0.09** | < 0.01 |
|  |  |  |  |  |  |
| **Two-way interactions** |  |  |  |  |  |
| *a* path X *M2* lag | < 0.01 | < 0.01 | **0.01** | **0.01** | < 0.01 |
| *a* path X *Y2* lag | < 0.01 | **0.01** | **0.03** | **0.03** | < 0.01 |
| Nobs X *Y2* lag | < 0.01 | < 0.01 | **0.01** | **0.01** | < 0.01 |
| *a* path X Nobs | < 0.01 | **0.01** | **0.04** | **0.03** | < 0.01 |
| *a* path X Stability | < 0.01 | **0.01** | **0.02** | **0.01** | < 0.01 |
| *Note.* Main effects and Interactions included in the table are all the effects with semi-partial *η*2  0.01 for at least one of the IPW estimators or Sequential G-estimator. All semi-partial *η*2  0.01 are bolded and underlined. | | | | | |

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| Table S5 | | | | | |
| *Semi-partial η2 for Predictors of Confidence Interval Coverage* | | | | | |
| Effect Type/Variables | IPW | IPW -Truncated 99% | IPW – Truncated 95% | IPW – Truncated 90% | Sequential G |
| **Main Effects** |  |  |  |  |  |
| Stability | **0.01** | **0.01** | **0.02** | **0.02** | <0.01 |
| Mediated Effect | <0.01 | <0.01 | **0.01** | **0.02** | <0.01 |
| Baseline Correlation | <0.01 | <0.01 | **0.01** | **0.01** | <0.01 |
| *M2* lag | <0.01 | <0.01 | **0.01** | **0.01** | <0.01 |
| *Y2* lag | <0.01 | **0.01** | **0.03** | **0.05** | <0.01 |
| Nobs | <0.01 | **0.01** | **0.06** | **0.07** | <0.01 |
|  |  |  |  |  |  |
| **Two-way interactions** |  |  |  |  |  |
| Mediated Effect X Nobs | <0.01 | <0.01 | **0.01** | **0.01** | <0.01 |
| Nobs X *Y2* lag | <0.01 | <0.01 | **0.01** | **0.01** | <0.01 |
| Mediated Effect X *Y2* lag | <0.01 | <0.01 | <0.01 | **0.01** | <0.01 |
| *Note.* Main effects and Interactions included in the table are all the effects with semi-partial *η*2 0.01 for at least one of the IPW estimators or Sequential G-estimator. All semi-partial *η*2  0.01 are bolded and underlined. | | | | | |

| Table S6 | | | | | | | | | | |
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| *Type 1 error rates for the controlled direct effect when not including the pretest measures of M and Y in the final step of Sequential G-estimation (CDE) and when including the pretest measures of M and Y in the final step of sequential G-estimation (CDE\_alt)* | | | | | | | | | | |
|  | | | *M2* cross-lag | | | | | | | |
| 0 | | | | 0.5 | | | |
| *Y2* cross-lag | | | | *Y2* cross-lag | | | |
| 0 | | 0.5 | | 0 | | 0.5 | |
| CDE | CDE\_alt | CDE | CDE\_alt | CDE | CDE\_alt | CDE | CDE\_alt |
| Nobs | Stability | Baseline Corr. | 0.059 | 0.058 | 0.058 | 0.057 | 0.059 | 0.060 | 0.061 | 0.063 |
| 50 | 0.3 | 0 |
| 0.5 | 0.059 | 0.059 | 0.059 | 0.059 | 0.059 | 0.060 | 0.056 | 0.060 |
| 0.7 | 0 | 0.059 | 0.061 | 0.056 | 0.057 | 0.059 | 0.059 | 0.058 | 0.064 |
| 0.5 | 0.058 | 0.060 | 0.060 | 0.065 | 0.057 | 0.060 | 0.058 | 0.057 |
| 100 | 0.3 | 0 | 0.058 | 0.058 | 0.055 | 0.056 | 0.055 | 0.056 | 0.057 | 0.058 |
| 0.5 | 0.055 | 0.056 | 0.059 | 0.056 | 0.053 | 0.056 | 0.058 | 0.059 |
| 0.7 | 0 | 0.055 | 0.058 | 0.057 | 0.055 | 0.058 | 0.057 | 0.054 | 0.055 |
| 0.5 | 0.051 | 0.057 | 0.056 | 0.057 | 0.057 | 0.061 | 0.054 | 0.055 |
| 200 | 0.3 | 0 | 0.054 | 0.056 | 0.053 | 0.054 | 0.054 | 0.051 | 0.055 | 0.054 |
| 0.5 | 0.052 | 0.053 | 0.056 | 0.055 | 0.052 | 0.050 | 0.056 | 0.054 |
| 0.7 | 0 | 0.054 | 0.055 | 0.053 | 0.055 | 0.054 | 0.055 | 0.052 | 0.053 |
| 0.5 | 0.054 | 0.054 | 0.055 | 0.054 | 0.053 | 0.053 | 0.056 | 0.055 |
| 500 | 0.3 | 0 | 0.057 | 0.054 | 0.056 | 0.051 | 0.056 | 0.056 | 0.053 | 0.053 |
| 0.5 | 0.051 | 0.052 | 0.053 | 0.055 | 0.051 | 0.051 | 0.051 | 0.055 |
| 0.7 | 0 | 0.051 | 0.054 | 0.057 | 0.055 | 0.050 | 0.052 | 0.054 | 0.053 |
| 0.5 | 0.051 | 0.052 | 0.052 | 0.053 | 0.055 | 0.051 | 0.055 | 0.053 |
| 1000 | 0.3 | 0 | 0.054 | 0.054 | 0.052 | 0.053 | 0.050 | 0.051 | 0.053 | 0.052 |
| 0.5 | 0.051 | 0.053 | 0.052 | 0.051 | 0.051 | 0.051 | 0.051 | 0.050 |
| 0.7 | 0 | 0.052 | 0.052 | 0.052 | 0.053 | 0.053 | 0.051 | 0.051 | 0.053 |
| 0.5 | 0.051 | 0.054 | 0.054 | 0.051 | 0.050 | 0.052 | 0.051 | 0.053 |
| CDE = Controlled direct effect  CDE\_alt = Controlled direct effect estimated with baseline *M* and *Y* included in the sequential G-estimation Equation described in Step 4 in the main manuscript. | | | | | | | | | | |

| Table S7 | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Power to detect the controlled direct effect when not including the pretest measures of M and Y in the final step of Sequential G-estimation (CDE) and when including the pretest measures of M and Y in the final step of sequential G-estimation (CDE\_alt)* | | | | | | | | | | |
|  | | | *M2* cross-lag | | | | | | | |
| 0 | | | | 0.5 | | | |
| *Y2* cross-lag | | | | *Y2* cross-lag | | | |
| 0 | | 0.5 | | 0 | | 0.5 | |
| CDE | CDE\_alt | CDE | CDE\_alt | CDE | CDE\_alt | CDE | CDE\_alt |
| Nobs | Stability | Baseline Corr. | 0.737 | 0.743 | 0.552 | 0.745 | 0.734 | 0.742 | 0.550 | 0.747 |
| 50 | 0.3 | 0 |
| 0.5 | 0.732 | 0.748 | 0.507 | 0.751 | 0.732 | 0.750 | 0.500 | 0.748 |
| 0.7 | 0 | 0.569 | 0.747 | 0.446 | 0.746 | 0.568 | 0.746 | 0.450 | 0.749 |
| 0.5 | 0.528 | 0.746 | 0.348 | 0.749 | 0.522 | 0.744 | 0.347 | 0.747 |
| 100 | 0.3 | 0 | 0.954 | 0.960 | 0.837 | 0.961 | 0.958 | 0.962 | 0.839 | 0.961 |
| 0.5 | 0.953 | 0.962 | 0.791 | 0.960 | 0.953 | 0.959 | 0.790 | 0.960 |
| 0.7 | 0 | 0.849 | 0.960 | 0.734 | 0.960 | 0.861 | 0.959 | 0.739 | 0.960 |
| 0.5 | 0.812 | 0.959 | 0.595 | 0.959 | 0.823 | 0.960 | 0.595 | 0.962 |
| 200 | 0.3 | 0 | 0.999 | 0.999 | 0.984 | 0.999 | 0.999 | 0.999 | 0.987 | 0.999 |
| 0.5 | 0.998 | 0.999 | 0.975 | 0.999 | 0.999 | 0.999 | 0.975 | 1.000 |
| 0.7 | 0 | 0.987 | 0.999 | 0.953 | 0.999 | 0.991 | 0.999 | 0.956 | 0.999 |
| 0.5 | 0.982 | 0.999 | 0.874 | 1.000 | 0.984 | 0.999 | 0.873 | 0.999 |
| 500 | 0.3 | 0 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.5 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.7 | 0 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.5 | 1.000 | 1.000 | 0.998 | 1.000 | 1.000 | 1.000 | 0.998 | 1.000 |
| 1000 | 0.3 | 0 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.5 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.7 | 0 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 0.5 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| CDE = Controlled direct effect  CDE\_alt = Controlled direct effect estimated with baseline *M* and *Y* included in the sequential G-estimation Equation described in Step 4 in the main manuscript. | | | | | | | | | | |