

# Articles (2020-2023)

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## References

**Cheung et al.: semlbci: An R package for forming likelihood-based confidence intervals for parameter estimates, correlations, indirect effects, and other derived parameters**

**Cheung-Pesigan-2023**

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Shu Fai Cheung and Ivan Jacob Agaloos Pesigan. “semlbci: An R package for forming likelihood-based confidence intervals for parameter estimates, correlations, indirect effects, and other derived parameters”. In: *Structural Equation Modeling: A Multidisciplinary Journal* (May 2023), pp. 1–15. DOI: [10.1080/10705511.2023.2183860](https://doi.org/10.1080/10705511.2023.2183860).

Abstract: There are three common types of confidence interval (CI) in structural equation modeling (SEM): Wald-type CI, bootstrapping CI, and likelihood-based CI (LBCI). LBCI has the following advantages: (1) it has better coverage probabilities and Type I error rate compared to Wald-type CI when the sample size is finite; (2) it correctly tests the null hypothesis of a parameter based on likelihood ratio chi-square difference test; (3) it is less computationally intensive than bootstrapping CI; and (4) it is invariant to transformations. However, LBCI is not available in many popular SEM software packages. We developed an R package, semlbci, for forming LBCI for parameters in models fitted by lavaan, a popular open-source SEM package, such that researchers have more options in forming CIs for parameters in SEM. The package supports both unstandardized and standardized

estimates, derived parameters such as indirect effect, multisample models, and the robust LBCI proposed by Falk.

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**McNeish et al.: Intensive longitudinal mediation in Mplus    McNeish-MacKinnon-2022**

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Daniel McNeish and David P. MacKinnon. “Intensive longitudinal mediation in Mplus”. In: *Psychological Methods* (Dec. 2022). DOI: [10.1037/met0000536](https://doi.org/10.1037/met0000536).

**Abstract:** Much of the existing longitudinal mediation literature focuses on panel data where relatively few repeated measures are collected over a relatively broad timespan. However, technological advances in data collection (e.g., smartphones, wearables) have led to a proliferation of short duration, densely collected longitudinal data in behavioral research. These intensive longitudinal data differ in structure and focus relative to traditionally collected panel data. As a result, existing methodological resources do not necessarily extend to nuances present in the recent influx of intensive longitudinal data and designs. In this tutorial, we first cover potential limitations of traditional longitudinal mediation models to accommodate unique characteristics of intensive longitudinal data. Then, we discuss how recently developed dynamic structural equation models (DSEMs) may be well-suited for mediation modeling with intensive longitudinal data and can overcome some of the limitations associated with traditional approaches. We describe four increasingly complex intensive longitudinal mediation models: (a) stationary models where the indirect effect is constant over time and people, (b) person-specific models where the indirect effect varies across people, (c) dynamic models where the indirect effect varies across time, and (d) cross-classified models where the indirect effect varies across both time and people. We apply each model to a running example featuring a mobile health intervention designed to improve health behavior of individuals with binge eating disorder. In each example, we provide annotated Mplus code and interpretation of the output to guide empirical researchers through mediation modeling with this increasingly popular type of longitudinal data.

**Nüst et al.: The Rockerverse: Packages and applications for containerisation with R**  
**Nust-Eddelbuettel-Bennett-et-al-2020**

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Daniel Nüst et al. “The Rockerverse: Packages and applications for containerisation with R”. In: *The R Journal* 12.1 (2020), p. 437. DOI: [10.32614/rj-2020-007](https://doi.org/10.32614/rj-2020-007).

Abstract: The Rocker Project provides widely used Docker images for R across different application scenarios. This article surveys downstream projects that build upon the Rocker Project images and presents the current state of R packages for managing Docker images and controlling containers. These use cases cover diverse topics such as package development, reproducible research, collaborative work, cloud-based data processing, and production deployment of services. The variety of applications demonstrates the power of the Rocker Project specifically and containerisation in general. Across the diverse ways to use containers, we identified common themes: reproducible environments, scalability and efficiency, and portability across clouds. We conclude that the current growth and diversification of use cases is likely to continue its positive impact, but see the need for consolidating the Rockerverse ecosystem of packages, developing common practices for applications, and exploring alternative containerisation software.

**Pesigan et al.: betaDelta and betaSandwich: Confidence intervals for standardized regression coefficients in R**  
**Pesigan-Sun-Cheung-2023**

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Ivan Jacob Agaloos Pesigan, Rong Wei Sun, and Shu Fai Cheung. “betaDelta and betaSandwich: Confidence intervals for standardized regression coefficients in R”. In: *Multivariate Behavioral Research* (Apr. 2023), pp. 1–4. DOI: [10.1080/00273171.2023.2201277](https://doi.org/10.1080/00273171.2023.2201277).

Abstract: The multivariate delta method was used by Yuan and Chan to estimate standard errors and confidence intervals for standardized regression coefficients. Jones and Waller extended the earlier work to situations where data are nonnormal by utilizing Browne’s asymptotic distribution-free (ADF) theory. Furthermore, Dudgeon developed standard errors and confidence intervals, employ-

ing heteroskedasticity-consistent (HC) estimators, that are robust to nonnormality with better performance in smaller sample sizes compared to Jones and Waller's ADF technique. Despite these advancements, empirical research has been slow to adopt these methodologies. This can be a result of the dearth of user-friendly software programs to put these techniques to use. We present the `betaDelta` and the `betaSandwich` packages in the R statistical software environment in this manuscript. Both the normal-theory approach and the ADF approach put forth by Yuan and Chan and Jones and Waller are implemented by the `betaDelta` package. The HC approach proposed by Dudgeon is implemented by the `betaSandwich` package. The use of the packages is demonstrated with an empirical example. We think the packages will enable applied researchers to accurately assess the sampling variability of standardized regression coefficients.