Introduction to Causal Modeling with Coincidence Analysis

3-5 August 2021, Regenstrief Institute, held online via Zoom

main instructor:

Michael Baumgartner, University of Bergen, Norway

additional presentations by:

Deborah Cragun, University of South Florida, USA
Edward Miech, Regenstrief Institute, USA

1   Workshop Description

This workshop offers an intensive 3-day introduction for health researchers to causal modeling with *Coincidence Analysis* (CNA), a relatively new configurational comparative method of data analysis geared towards causal complexity. The main developer of CNA, Michael Baumgartner, will guide participants through the nuts and bolts of configurational data analysis as well as cutting-edge methodological innovations. In replicating published studies from various areas of the health sciences, he will also demonstrate how to make the most of current software for CNA. In additional presentations, Deborah Cragun and Edward Miech, both of whom have extensive experience in conducting research with CNA, will offer advice on practical issues, such as getting funded and published with CNA.

From Boolean algebra and the philosophical roots of regularity theories of causation, over the basic ideas behind CNA's search algorithm, and measures of fit to multi-outcome structures, model ambiguities, and robustness analyses this introduction will enable participants to conduct CNA analyses themselves and review those of other researchers in a sophisticated manner.

After the workshop, the instructors will remain available for consultation to help participants with the methodological and practical aspects of their research projects.

2 Workshop Schedule

Day	Module and Topics Covered
Day 1; Tuesday, 3 August 2021	
10:00 - 10:30	**Intro:** Why CNA in Health Services Research?
10:30 - 11:30	**Module 1.1:** Methodological Landscape and the Essentials of Boolean Algebra
11:30 - 11:45	Break
11:45 - 12:45	**Module 1.2:** Causation
12:45 - 13:30	Lunch Break
13:30 - 14:15	**Module 1.3:** The General Principles of Configurational Causal Discovery
14:30 - 14:45	Break
14:45 - 15:45	**Module 1.4:** Top-down vs. Bottom-up Search / the CNA algorithm

Essential readings

- Baumgartner, Michael. 2020. "Causation." In: *The SAGE Handbook of Political Science*, ed. by D. Berg-Schlosser, B. Badie, and L. Morlino, London: SAGE, pp. 305-321. (brief overview of theories of causation)

- Baumgartner, Michael, and Mathias Ambühl. 2020. "Causal modeling with multi-value and fuzzy-set Coincidence Analysis." *Political Science Research and Methods* 8 (3):526-42. (introduction of the current CNA algorithm)

- Mackie, John L. 1965. "Causes and conditions." *American Philosophical Quarterly* 2 (4):245-64. (central piece on the INUS theory of causation)

- Mill, John Stuart [edited by J. M. Robson]. 2006, 1973, [1843]. *A system of logic, ratiocinative and inductive.* Toronto: University of Toronto Press, pp. 388-406, 434-453. (central piece about methods of causal inference)

Supplementary readings

- Barringer, Sondra N., Scott R. Eliason, and Erin Leahey. 2013. "A history of causal analysis in the social sciences." In *Handbook of Causal Analysis for Social Research*, ed. S. L. Morgan. Dordrecht: Springer, pp. 9-26.

- Baumgartner, Michael and Christoph Falk. 2019. "Boolean difference-making: A modern regularity theory of causation." *The British Journal for the Philosophy of Science.* doi: 10.1093/bjps/axz047. (technical introduction to the theory of causation behind CNA)

- Ragin, Charles C. 1987. *The comparative method: Moving beyond qualitative and quantitative strategies.* Berkeley: University of California Press. (first and still very readable introduction of QCA)

- Thiem, Alrik, Michael Baumgartner, and Damien Bol. 2016. "Still lost in translation! A correction of three misunderstandings between configurational comparativists and regressional analysts." *Comparative Political Studies* 49(6):742-74. (discussion of the differences between Boolean and linear algebra)

10:00 - 10:45	**Module 2.1:** Data Types and Calibration
10:45 - 11:15	**Practical presentation:** Factor Selection
11:15 - 11:30	Break
11:30 - 12:15	**Module 2.2:** Measures of Fit
12:15 - 13:15	Lunch Break
13:15 - 14:15	**Module 2.3:** Introduction to the CNA ℝ package (with a short introduction to ℝ)
14:15 - 14:30	Break
14:30 - 15:30	**Module 2.4:** Replication Session

Essential readings

- Baumgartner, Michael, and Mathias Ambühl. 2021. "**cna:** An ℝ package for configurational causal inference and modeling." ℝ package vignette: The Comprehensive R Archive Network. Package version 3.1. https://cran.r-project.org/web/packages/cna/vignettes/cna_vignette.pdf. (introduction to the CNA ℝ package)

- Ragin, Charles C. 2006. "Set relations in social research: Evaluating their consistency and coverage." *Political Analysis* 14 (3):291-310. (introduction of consistency and coverage as measures of fit)

- Thiem, Alrik, and Adrian Dușa. 2013. *Qualitative Comparative Analysis with R: A user's guide*. New York: Springer, pp. 51-62 (chapter on calibration of fuzzy sets).

- Yakovchenko, Vera, Edward Miech, et al., and Shari Rogal. 2020. "Strategy configurations directly linked to higher Hepatitis C virus treatment starts. An applied use of configurational comparative methods, *Medical Care* 58(5), pp. e31-e38, doi: 10.1097/MLR.0000000000001319. (factor selection in practice)

Supplementary readings

- Schneider, Carsten Q., and Claudius Wagemann. 2012. *Set-Theoretic methods for the social sciences: A guide to Qualitative Comparative Analysis (QCA)*. Cambridge: Cambridge University Press, pp. 93-104; 151-177; 255-263.

- Whitaker, Rebecca, Nina Sperber, et al., and Sarah Birken. 2020. "Coincidence Analysis: A new method for causal inference in implementation science." *Implementation Science*. doi: 10.21203/rs.3.rs-58815/v1. (introduction to CNA from a health science perspective)

10:00 - 10:45	**Module 3.1:** Model Ambiguities
10:45 - 11:15	**Practical presentation:** Getting Funded and Published with CNA
11:15 - 11:30	Break
11:30 - 12:15	**Module 3.2:** Interpreting the Output / "Back to the Cases"
12:15 - 13:00	Lunch Break
13:00 - 14:00	**Module 3.3:** Overfitting and Robustness
14:00 - 14:15	Break
14:15 - 15:15	**Module 3.4:** Replication Session
15:15 - 15:45	**Extro:** Revisiting 'Why CNA in Health Services Research?'

Essential readings

- Baumgartner, Michael and Mathias Ambühl. 2021. "**cna:** An R package for configurational causal inference and modeling." R package vignette: The Comprehensive R Archive Network. Package version 3.1. https://cran.r-project.org/web/packages/cna/vignettes/cna_vignette.pdf.

- Baumgartner, Michael, and Alrik Thiem. 2017. "Model ambiguities in configurational comparative research." *Sociological Methods & Research* 46 (4):954-87. (discussion of the problem of model ambiguities)

- Parkkinen, Veli-Pekka, and Michael Baumgartner. 2021. "Robustness and model selection in configurational causal modeling." *Sociological Methods & Research.* doi: 10.1177/0049124120986200. (introduction to robustness analysis with CNA)

Supplementary readings

- Arel-Bundock, Vincent. 2019. "The double bind of Qualitative Comparative Analysis." *Sociological Methods & Research.* doi: 10.1177/0049124119882460. (discussion of the problem of overfitting)

- Cohen, Deborah J., Shannon M. Sweeney, et al., and Miguel Marino 2021. "Improving smoking and blood pressure outcomes: The interplay between operational changes and local context." *The Annals of Family Medicine* 19 (3):240-248. doi: 10.1370/afm.2668. (CNA application)

- Dy, Sidney, Ryan Acton, et al., and Sarah Hudson. 2020. "Association of Implementation and Social Network Factors With Patient Safety Culture in Medical Homes. A Coincidence Analysis." *Journal of Patient Safety.* doi: 10.1097/PTS.0000000000000752. (CNA application)

- Haesebrouck, Tim. 2019. "Who follows whom? A Coincidence Analysis of military action, public opinion and threats." *Journal of Peace Research* 56(6): 753-766. (CNA application)