



APPENDIX AVAILABLE ON REQUEST

Research Report 137

The Influence of Improved Air Quality on Mortality Risks in Erfurt, Germany

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Appendix D. Time-Varying Models and Cause-Specific Mortality

Note: Appendices Available on the Web appear in a different order than in the original Investigators' Report. HEI has not changed these documents. Appendices were relettered as follows:

Appendix B was originally Appendix A
Appendix C was originally Appendix B
Appendix D was originally Appendix C
Appendix E was originally Appendix D

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Although this document was produced with partial funding by the United States Environmental Protection Agency under Assistance Award CR-83234701 to the Health Effects Institute, it has not been subjected to the Agency's peer and administrative review and therefore may not necessarily reflect the views of the Agency, and no official endorsement by it should be inferred. The contents of this document also have not been reviewed by private party institutions, including those that support the Health Effects Institute; therefore, it may not reflect the views or policies of these parties, and no endorsement by them should be inferred.

This document was reviewed by the HEI Health Review Committee but did not undergo the HEI scientific editing and production process.

Appendix C. Time-varying models and cause-specific mortality

In this analysis, we considered subgroups by prevalent diseases. As a basis, we used the confounder model determined from the total deaths time series. The lags of the models were, in general, chosen based on the total deaths analysis. Only for the subgroup of respiratory deaths, we considered all lags from 0 to 5 as this subgroup may have different underlying mechanisms. The wide 95% credible intervals for the respiratory subgroup analyses are due to the small number of daily respiratory death counts (see section 3.1.2). Figure C.1 presents the results for the association of CO, lag 4 and daily mortality in four categories of prevalent disease, that is cardio-respiratory, cardiovascular, cardiovascular only, and respiratory. Compared to the total mortality analysis (see section 3.4.1.1), the results of these subgroups are quite similar. Again, the largest time-varying effects were observed during the period mid of 1996 to the beginning of 1998. An examination of the lag structure of CO for respiratory deaths revealed that there was no real association between CO and respiratory mortality (results not shown).

Figure C.2 shows the results of the subgroup analysis for the association of NO₂ with a lag of 3 days and mortality. The strongest associations were observed for the subgroup of cardiovascular only deaths (Figure C.2, bottom left). Regarding the respiratory mortality, the largest association was seen for a one-day lag (Figure C.2, bottom right). The time-varying patterns of the effects for cardiovascular or respiratory deaths, cardiovascular, and cardiovascular only were quite similar to the one of the total deaths analysis. For respiratory deaths, however, a different pattern was seen with the largest effects observed between the years 1997 to 1999.

Figure C.3 presents the results of the subgroup analysis for ultrafine particles (NC_{0.01-0.1} (imp)). For this analysis, we considered only the period between September 1995 and August 2001, similar to section 3.3.1.2. The time-varying patterns of the effects for cardiovascular or

respiratory deaths, cardiovascular, and cardiovascular only were quite similar to the one of the total deaths analysis. The strongest association for respiratory mortality was seen with a lag of one day (Figure C.3, bottom right).

The results of the subgroup analysis for O₃ with a lag of 2 days are shown in Figure C.4. For all subgroups, the level of the estimates was lowest in sub-period 2 and the strongest associations with mortality were seen in sub-period 1. Regarding the lag structure of respiratory deaths, the largest effects were also seen for a delay of two days (Figure C.4, bottom right).

Figure C.1: Time-varying association of CO, lag 4 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left), and respiratory deaths (bottom right) in Erfurt, old city limits.

Figure C.2: Time-varying association of NO₂, lag 3 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left) deaths, and time-varying association of NO₂, lag 1 and respiratory mortality (bottom right) in Erfurt, old city limits.

Figure C.3: Time-varying association of NC_{0.01-0.1}(imp), lag 4 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left) deaths, and time-varying association of NC_{0.01-0.1}(imp), lag 1 and respiratory mortality (bottom right) in Erfurt, new city limits.

Figure C.4: Time-varying association of O₃, lag 2 for cardiovascular or respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left), and respiratory deaths (bottom right), old city limits.

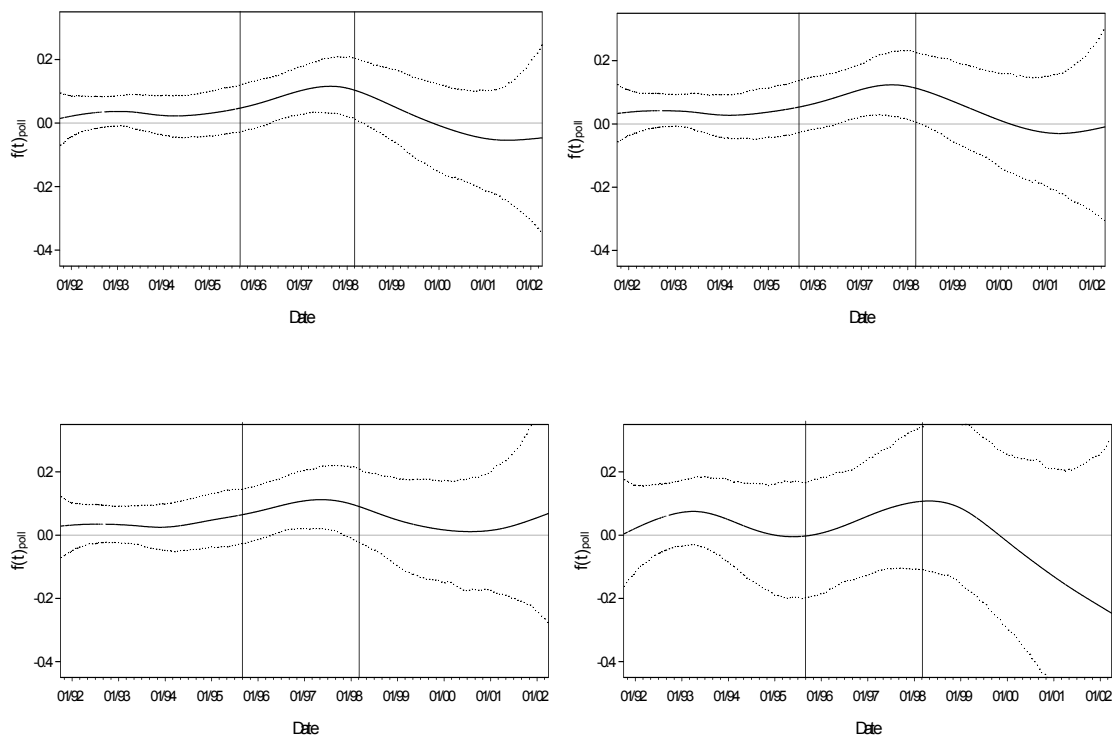


Figure C.1: Time-varying association of CO, lag 4 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left), and respiratory deaths (bottom right) in Erfurt, old city limits.

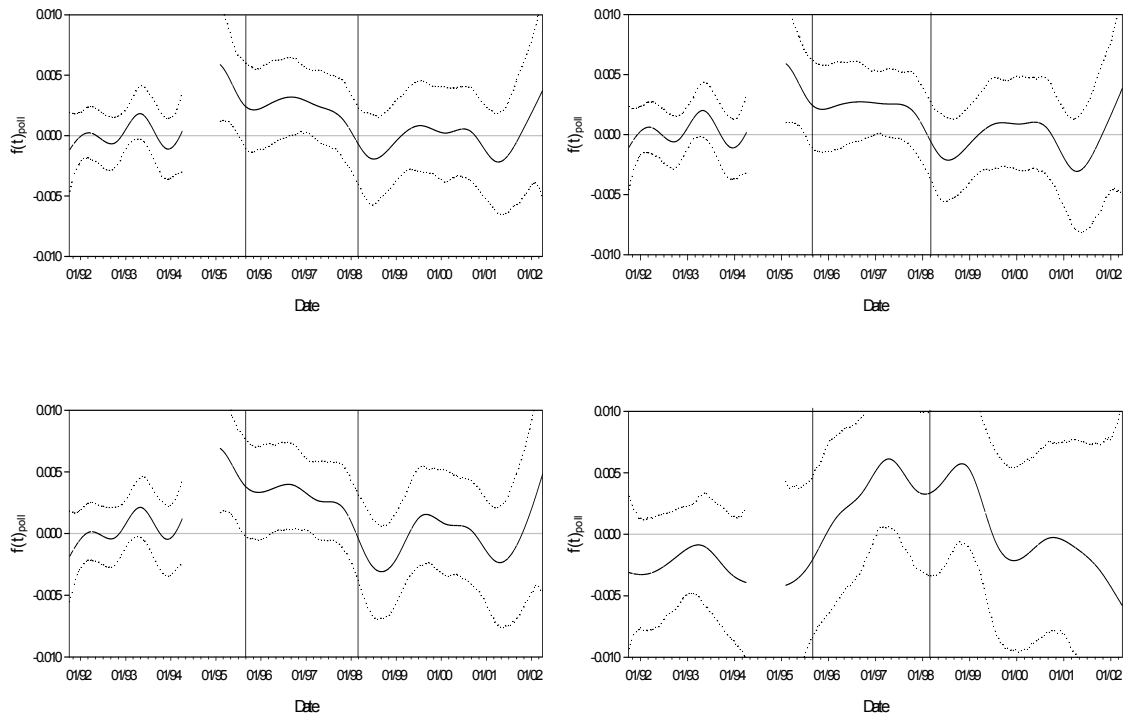


Figure C.2: Time-varying association of NO₂, lag 3 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left) deaths, and time-varying association of NO₂, lag 1 and respiratory mortality (bottom right) in Erfurt, old city limits.

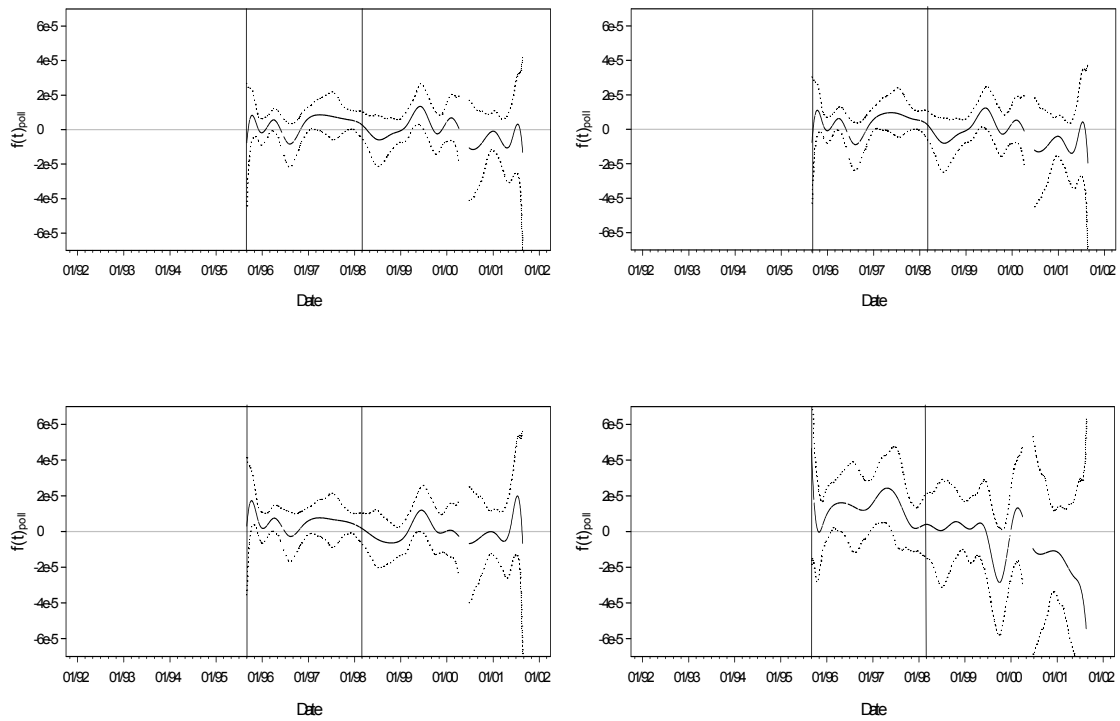


Figure C.3: Time-varying association of $NC_{0.01-0.1}(\text{imp})$, lag 4 for cardio-respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left) deaths, and time-varying association of $NC_{0.01-0.1}(\text{imp})$, lag 1 and respiratory mortality (bottom right) in Erfurt, new city limits.

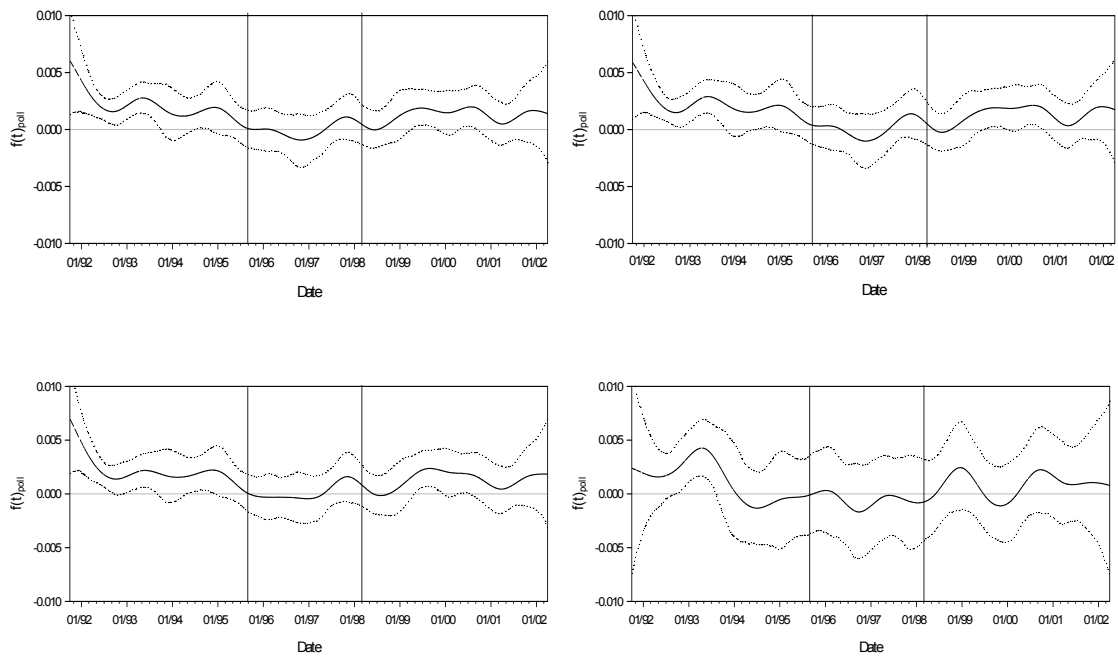


Figure C.4: Time-varying association of O₃, lag 2 for cardiovascular or respiratory (top left), cardiovascular (top right), cardiovascular only (bottom left), and respiratory deaths (bottom right), old city limits.