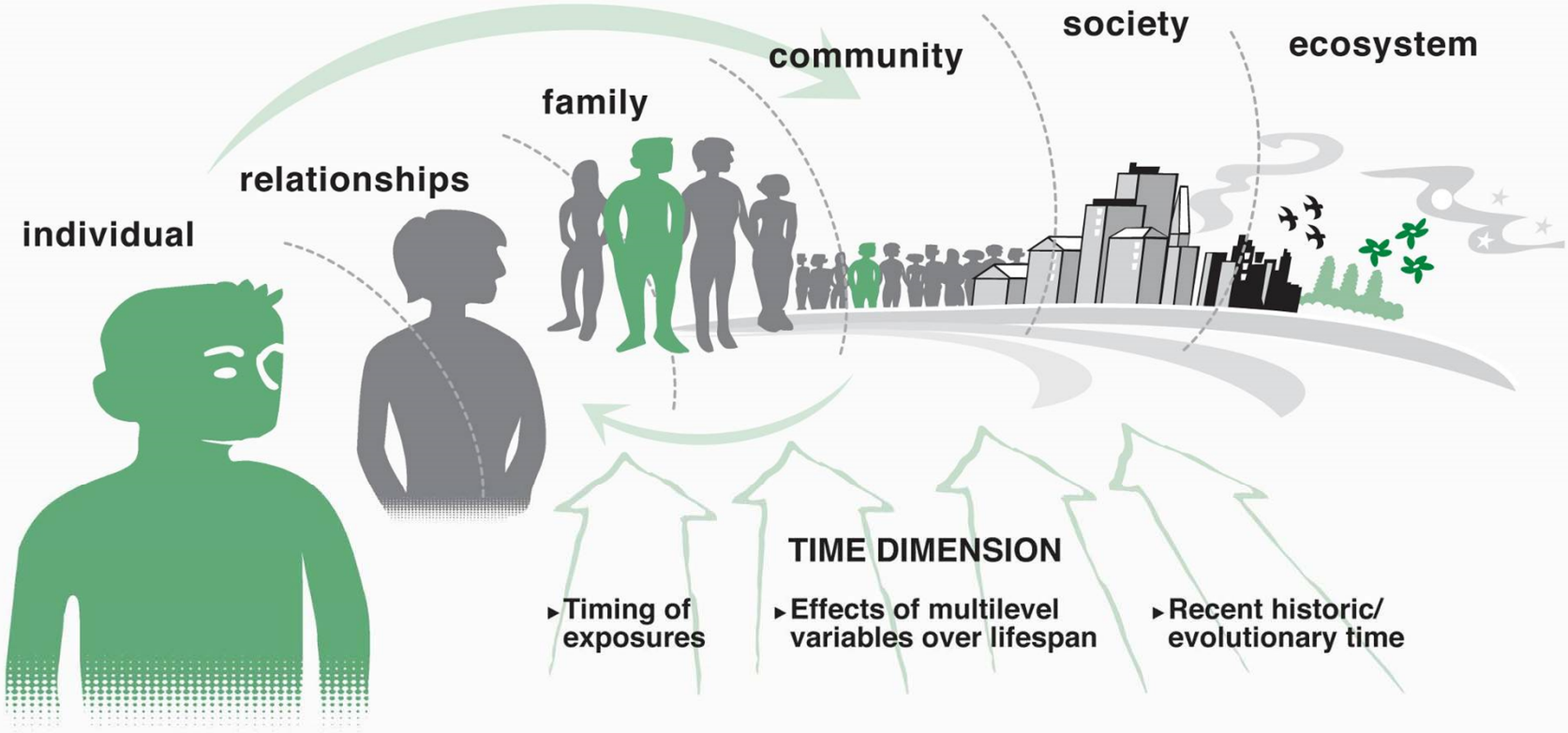
# Cumulative exposures: Cumulative effects

## Northwest Children's Environmental Health Forum—2013

Ted Schettler MD, MPH
Science and Environmental Health Network
www.sehn.org

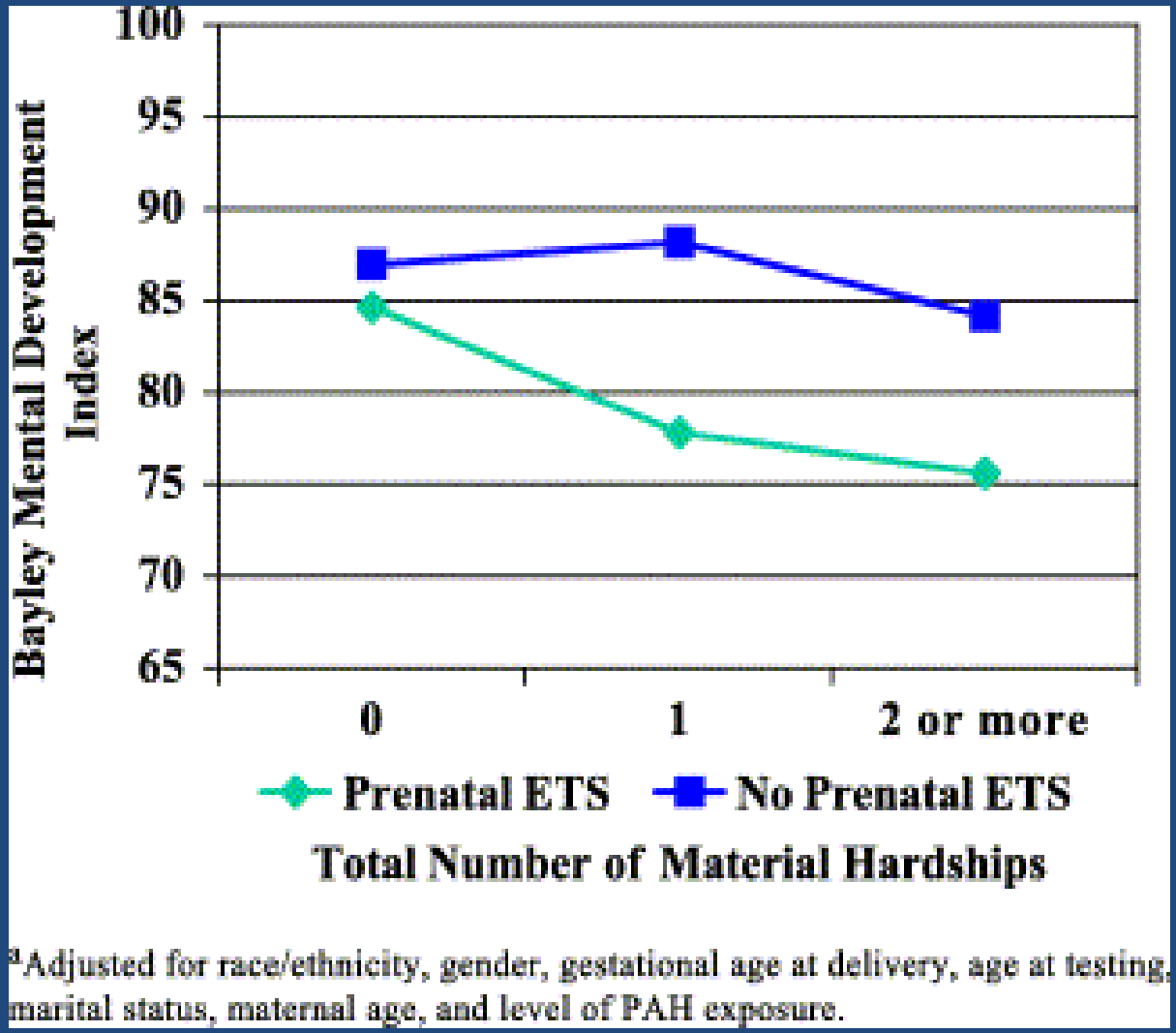
# An ecological or "systems" health framework considers the individual in the context of family, community, society, and ecosystem.



# Cumulative exposures; effects

- Cumulative exposures
  - Food, chemical/contaminant, built, social environments; multi-level
- Cumulative effects
  - Health outcomes: increased risk of various adverse pregnancy outcomes; increased risk of chronic diseases; co-morbidities

n=226, 2 yr old MDI; prenatal ETS, material hardships
Columbia Center for Children's Environmental Health




Rauh et al, Neurotox Teratol, 2004

# Premature birth

- Consequences depend on actual gestational age and birth weight
- Increased infant illness and mortality
- Adverse effects on neurological development, immune system, other
- Large economic costs—individuals, families, society

# Premature birth, traffic density, season, community economic status

- Season: more air pollution in winter
- Low SES: > 10% unemployment, > 20% of families in poverty, and > 15% receiving public assistance.
- High SES: < 10% unemployed, < 20% of families living in poverty, and < 15% receiving public assistance.

(Ponce, Am J Epid, 2005)

# Air pollution, poverty, premature births

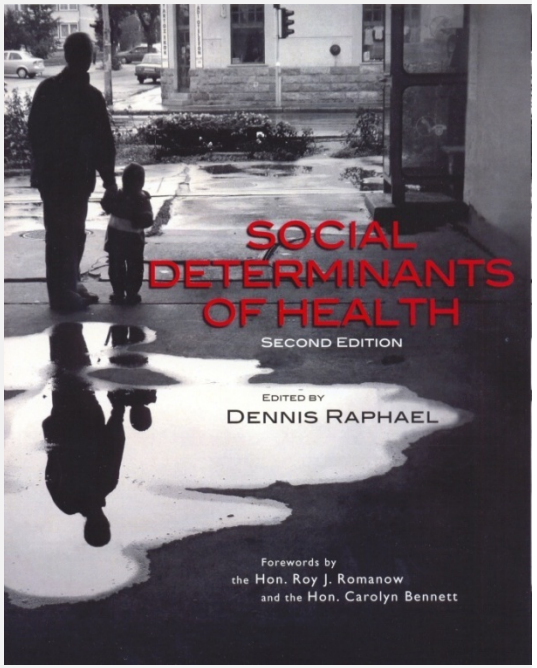
- Low SES community: higher traffic-related pollution exposure had 30% increased risk of preterm delivery compared with those who lived in less trafficked locations.
- Middle SES: traffic density was associated with 18–19% increased risk of preterm birth during both seasons.
- High SES: high traffic not associated with increase preterm delivery risk

# Air pollution, poverty, premature births

- Conclusion: Reducing preterm births warrants a concerted effort of social, economic, and environmental policies, focused not only on individual risk factors but also the reduction of localized air pollution, expansion of health-care coverage, and improvement of neighborhood resources.

# Socioeconomic, Psychosocial Stressors

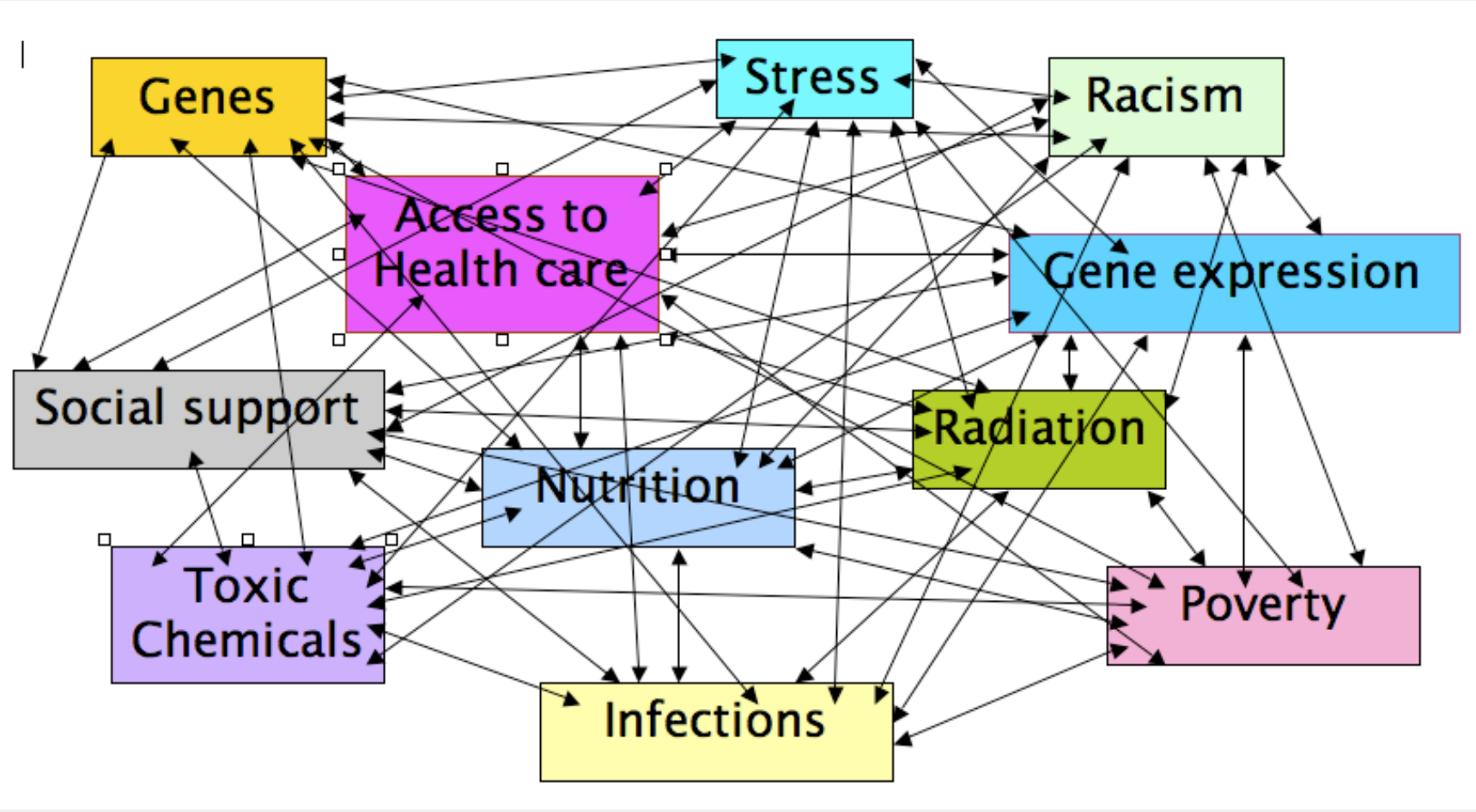
Lower socioeconomic status → ⇧ risk of impaired neurodevelopment, cardiovascular disease, diabetes, obesity, Alzheimer's disease, many kinds of cancer, asthma.




Due to: Combinations of increased exposures to hazards, increased susceptibility, decreased capacity to cope and recover.

Elevated levels of inflammatory markers, stress hormones, altered immune function

# Complex Web of Variables Influences Pregnancy Outcomes



# Why do this?

- **to acknowledge, communicate complexity**
- confirms the multi-level, systemic nature of the issues
- highlights the need for broad and diversified efforts to study and change the dynamics of the system.
- **to make sense of complexity.**
- helps in understanding the system
- Once the general architecture of a model is grasped, it becomes a filter for identifying relevant variables and an aid to thinking about the further study and interventions

# Why do this?

- **to support the development of strategies to study and intervene**
- Suggests ways and places to intervene most effectively in the system.
- These are: leverage points, feedback loops, and causal cascades, among others