Determining the Public Health Consequences of Terrorism on Maternal-Child Health

Kathleen Sherrieb, DrPH

Fran Norris, PhD

Dartmouth Medical School & NCPTSD

Sandro Galea, MD, DrPH

Columbia University

Fourth Annual DHS

University Network Summit

March 12, 2010

START

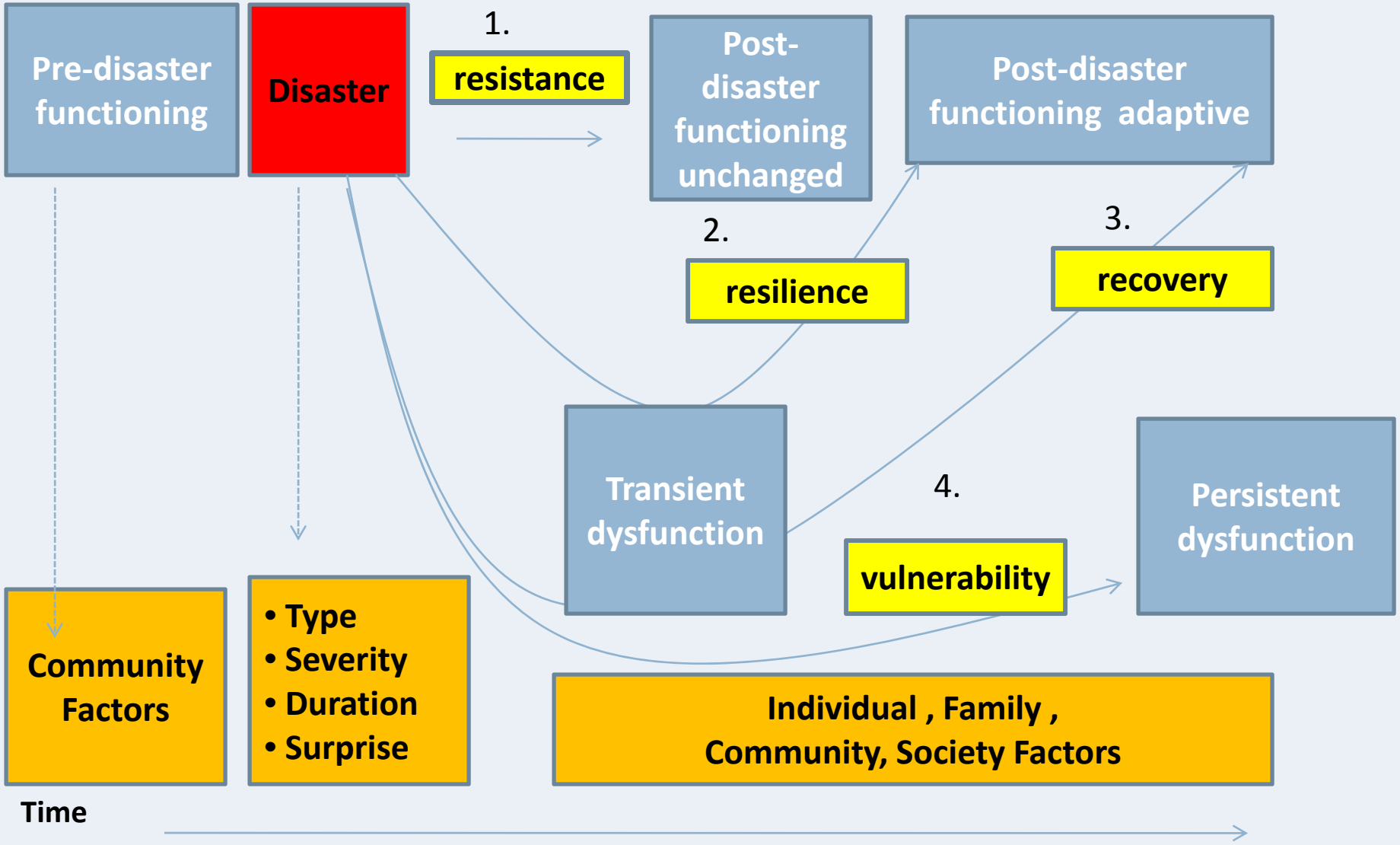
NATIONAL CONSORTIUM FOR THE
STUDY OF TERRORISM AND RESPONSES TO TERRORISM

A CENTER OF EXCELLENCE OF THE
U.S. DEPARTMENT OF HOMELAND SECURITY
BASED AT THE UNIVERSITY OF MARYLAND

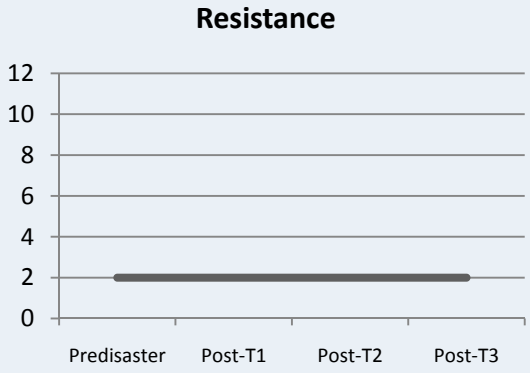
What is resilience?

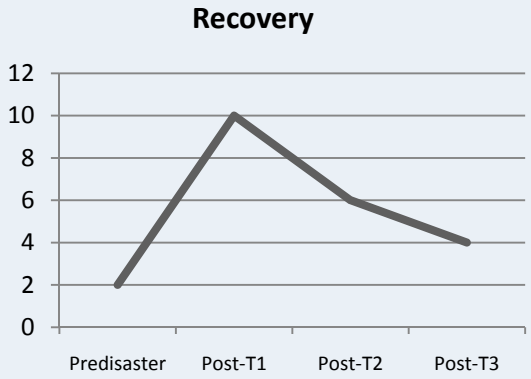
- Physical: “speed with which a system *returns to equilibrium* after displacement” (Bodin, 2004)
- Ecological: “positive *adaptation* in response to adversity; not just the absence of vulnerability” (Waller, 2001)
- Social: “ability of communities to *withstand external shocks* to their social infrastructure” (Adger, 2000)
- Individual: “good adaptation under extenuating circumstances; a *recovery trajectory that returns to baseline* following a challenge” (Butler, 2007)
- Community: “a process linking a set of adaptive capacities to a positive trajectory of functioning & adaptation after a disturbance” (Norris et al., 2008)

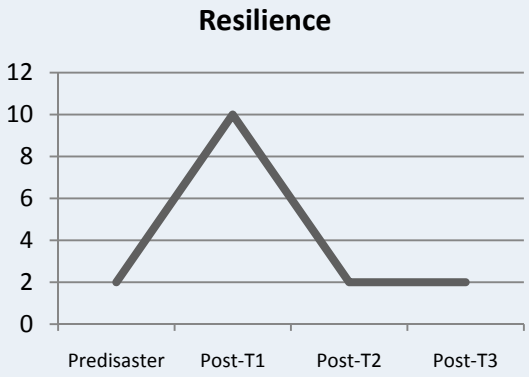
A Theory of Disaster Response

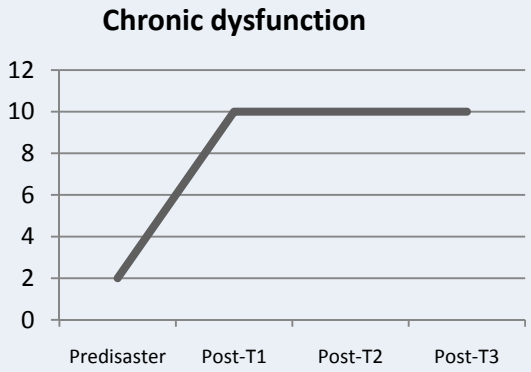


Models of Longitudinal Trajectories of Responses to Disaster Distress by Individuals





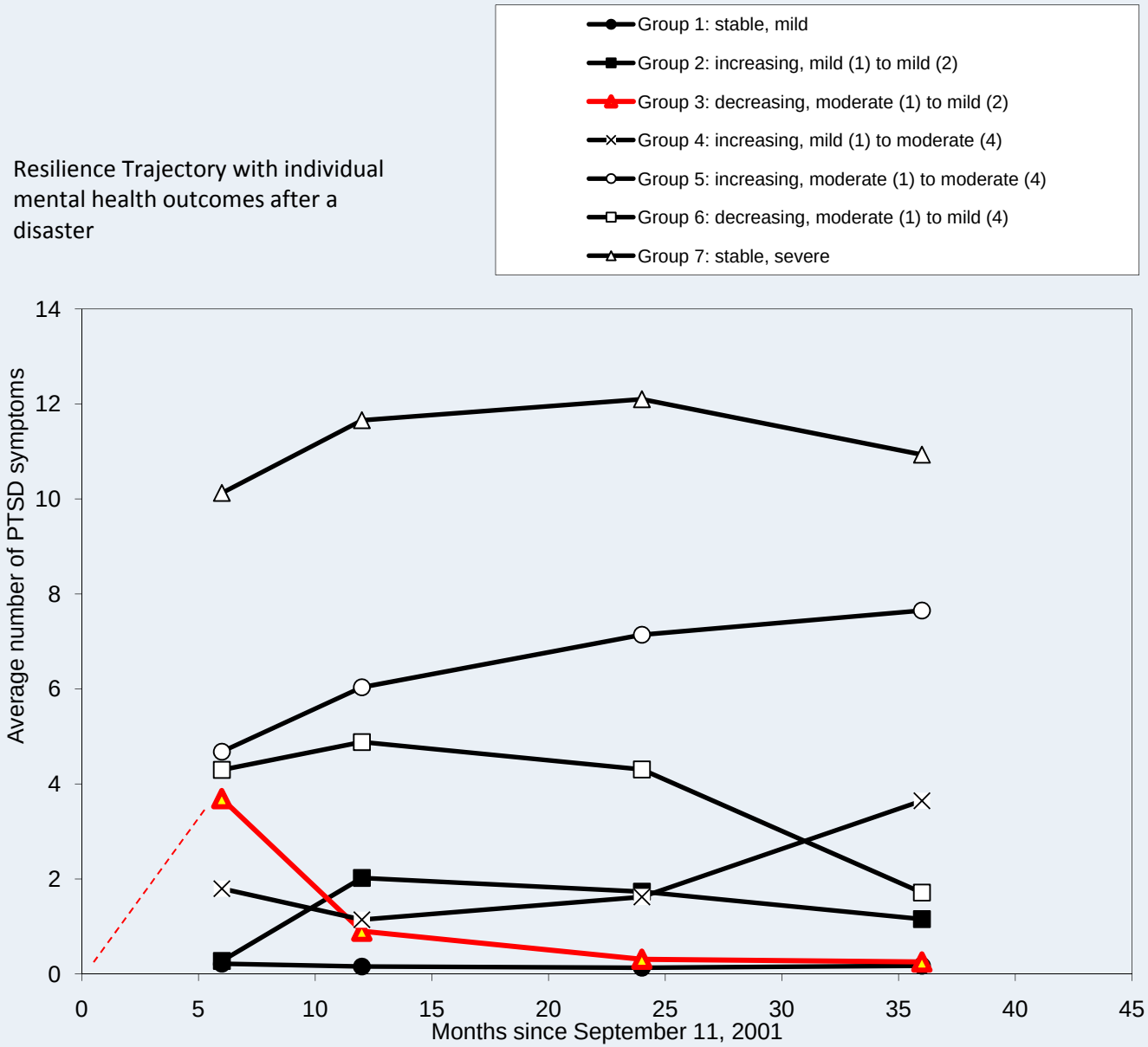




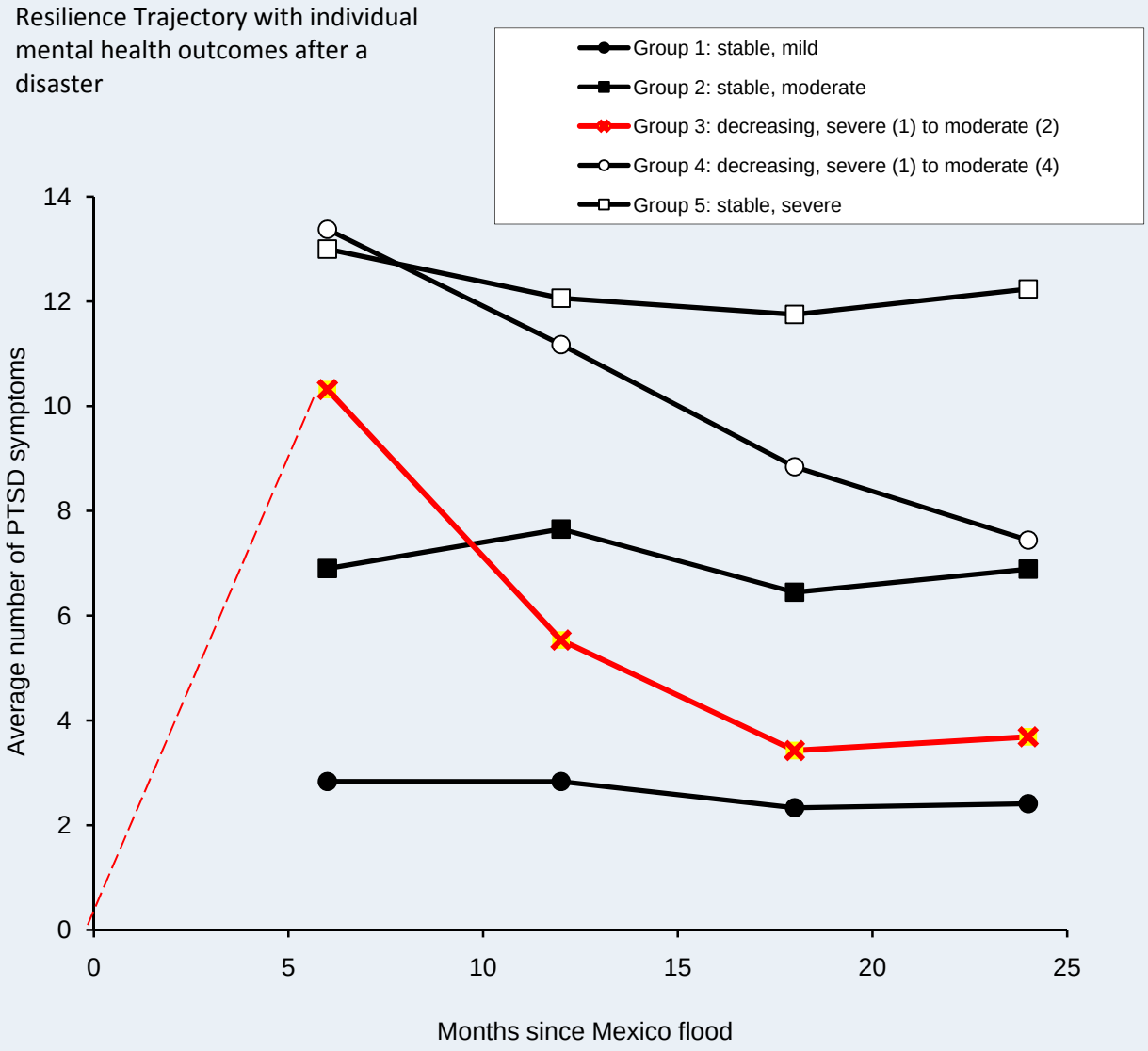
Norris, Tracy, & Galea (2009). Looking for resilience: Understanding the longitudinal trajectories of responses to stress. Social Science & Medicine.

Trajectories of PTSD symptoms among residents of the New York City metropolitan area (n = 1,267) after the September 11, 2001 attacks (Norris, Tracy, Galea, 2009)

Resilience Trajectory with individual mental health outcomes after a disaster



Trajectories of PTSD symptoms among residents of Villahermosa and Teziutlán in Mexico (n = 561) after the 1999 flood



Public Health Consequences of Terrorism

Questions

Do the trajectories seen in ***individuals*** translate to ***populations***? Does general exposure to a disaster by a community result in population health changes?

If so, can we identify ***patterns*** in population indicators that are similar to the patterns seen among individuals?

Indicators

Population health indicators chosen for study - pregnancy & birth (IMR, LBW):

- women & children are identified as ***vulnerable populations*** post-disaster
- these short-term indicators represent short-term changes that may act as a ***warning system*** to presage more long term health problems.

Public Health Consequences of Terrorism

Hypotheses

Population effects will mimic the trajectories that have been observed post-disaster in previous studies:

- No effect (resistance)
- Negative effect with rapid recovery, possibly improvement (resilience)
- Slower recovery to baseline or even less (recovery)
- Decline with no return to baseline (dysfunction)

Background Support

Research studies relate poor birth outcomes to:

- prenatal psychological stress (LBW, Preterm delivery)
- severe negative life events
- disasters
- 9/11 attack on the WTC

Public Health Consequences of Terrorism

Data

Maternal-child health indicators of Infant Mortality Rate (IMR), Low Birth Weight (LBW) rate were examined in a time series over the period of 1962-2007 (n=47).

NYC (5 boroughs) chosen for study, 9/11 chosen as disaster event of interest

Publicly available archived data were sought – electronic data availability varied by amount of historical data, time interval, & geographic unit of measure.

Comparisons were made to Upstate NY data and USA data for the indicators to test the issue of “decay” of effect with distance & to check that the NYC trend, if there, is not just mirroring a regional or national trend

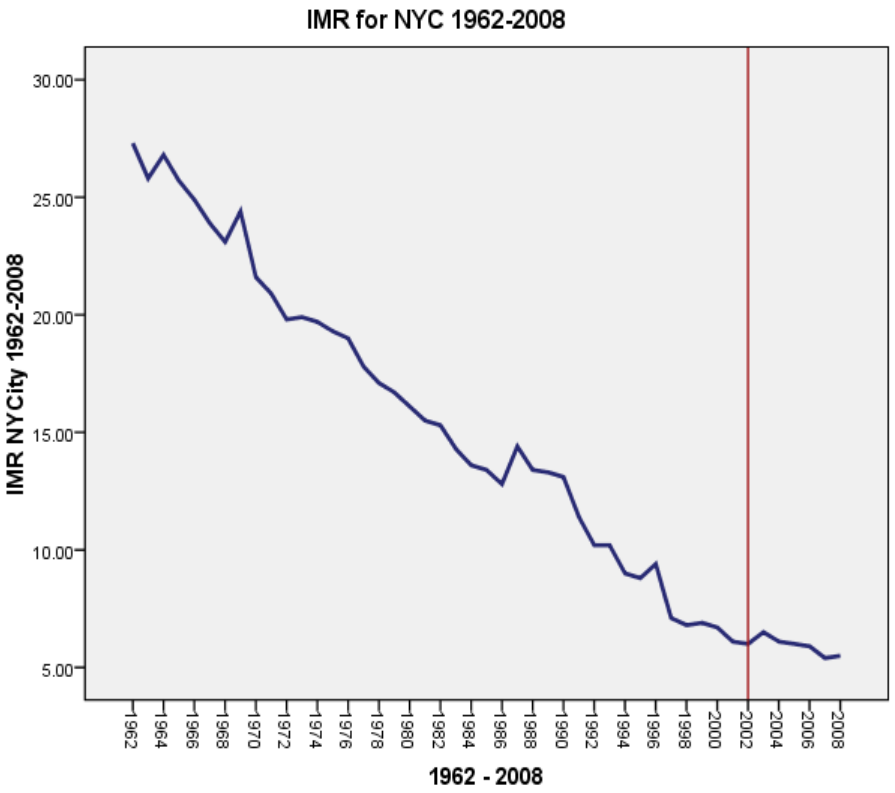
Public Health Consequences of Terrorism

Methods

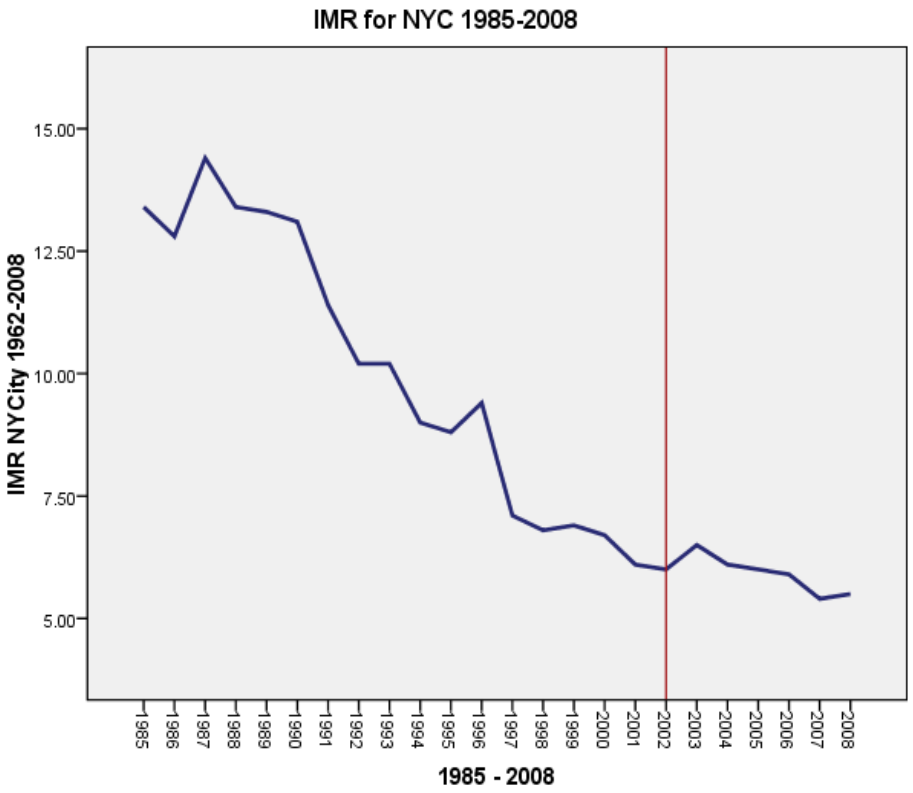
Interrupted time series analyses were used to test whether the pre-9/11 trends in IMR and LBW% were resistant to the effect of 9/11 or had a detectable increase that was temporary, delayed, or sustained.

Autoregressive integrated moving average (ARIMA) techniques were used to define a univariate model that accounts for the long term time trend & the autocorrelational nature of the time series data.

The intervention/event is then added to the model to determine if there is a difference in the rates of occurrence in the indicators.



47 time point years with event line at 2002; IMR ranges from 27.3 in 1962 to 5.5 in 2008



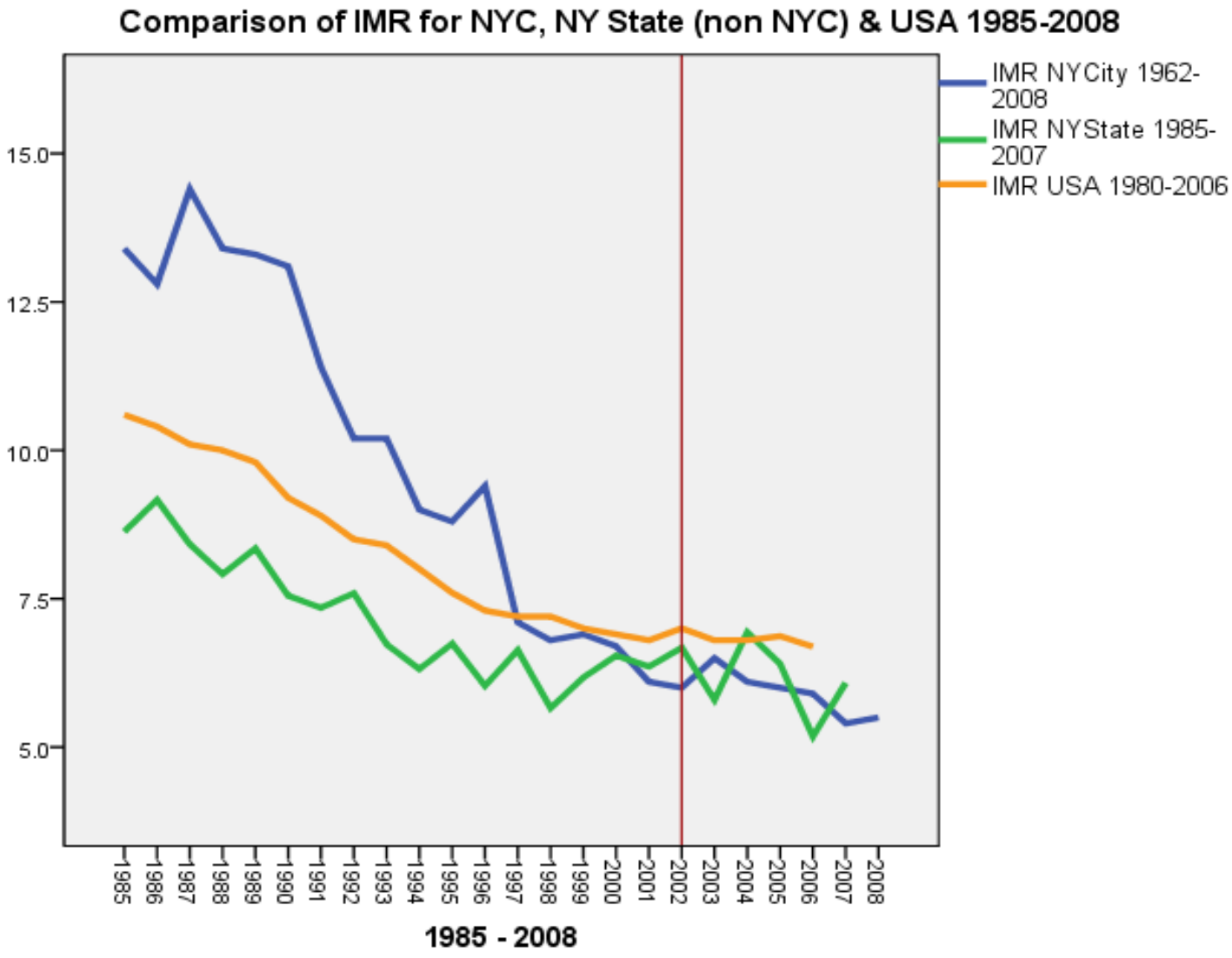
27 time point years with event line at 2002; IMR ranges from 13.4 in 1985 to 5.5 in 2008

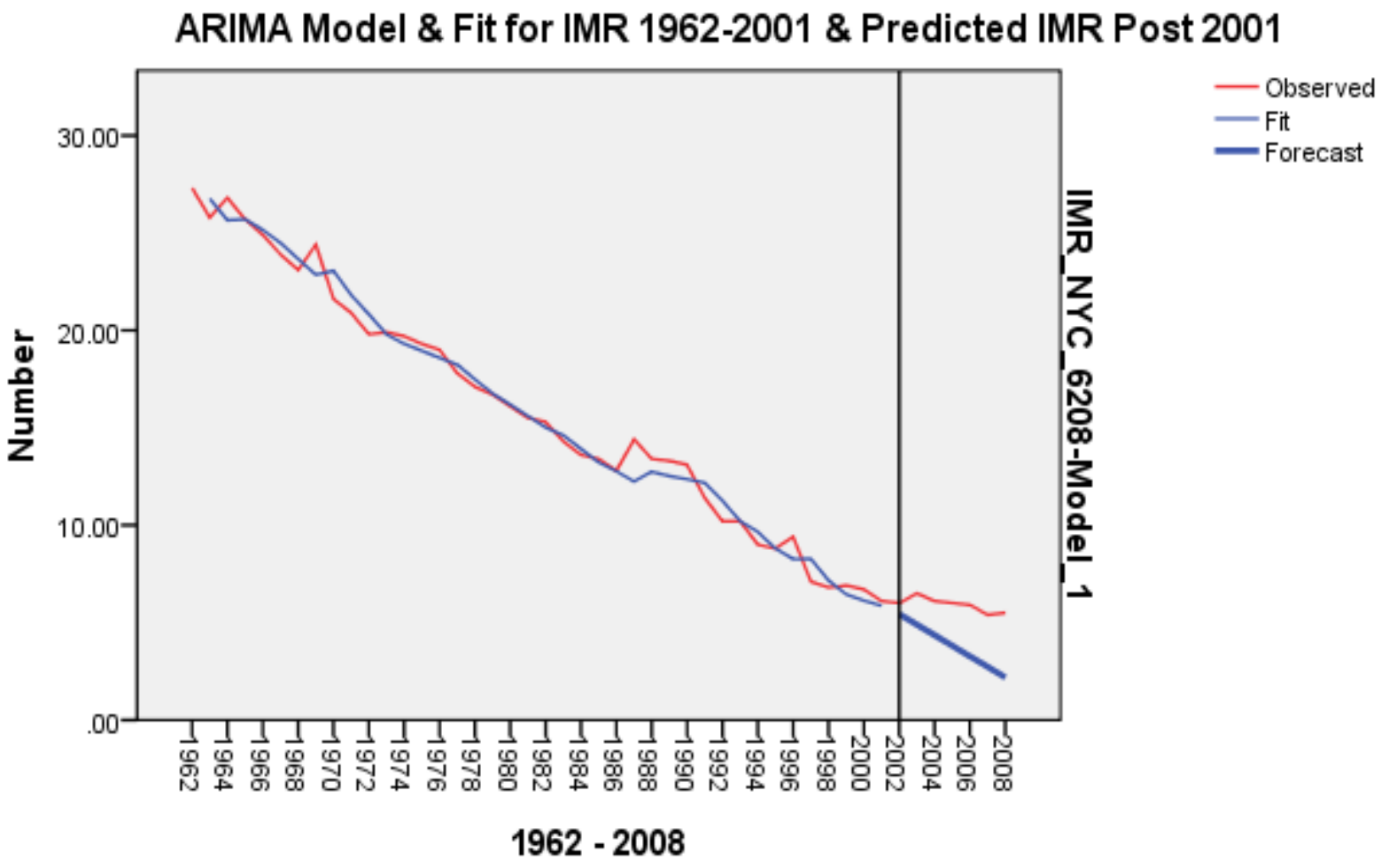
Mean (SD)

NYC 8.9 (3.1)

NYS 6.9 (1.0)

USA 8.1 (1.4)




ARIMA Model & Fit for IMR 1962-2001 & Predicted IMR Post 2001
Observed
Fit
Forecast
Number
30.00
20.00
10.00
.00
IMR_NYC_6208-Model_1
1962
1964
1966
1968
1970
1972
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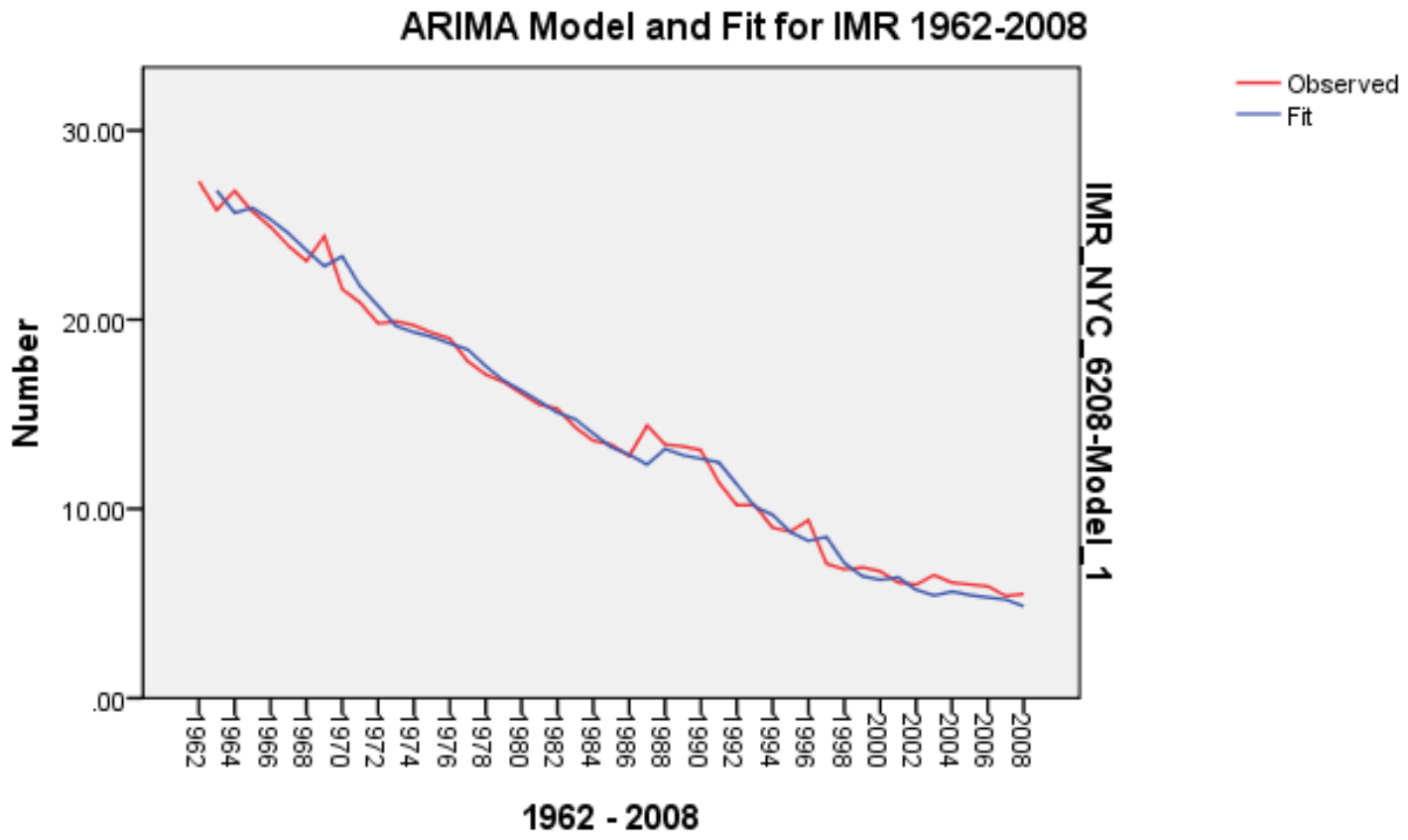
1962 - 2008


ARIMA Model and Fit for IMR 1962-2008
Observed
Fit
Number
30.00
20.00
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1962
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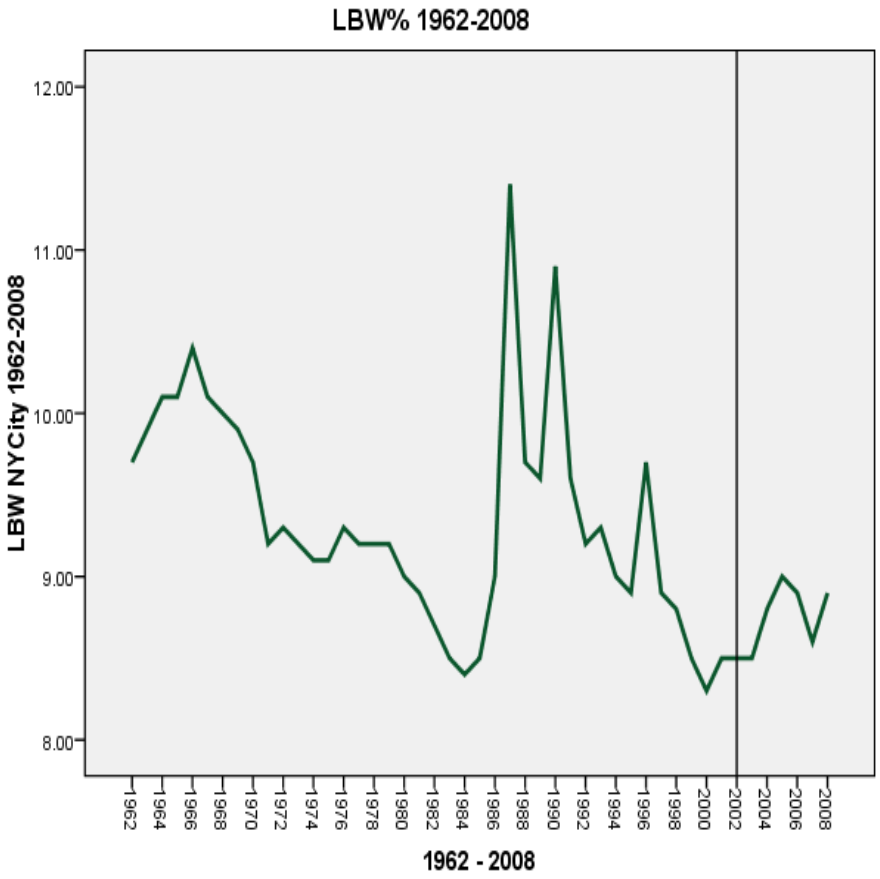
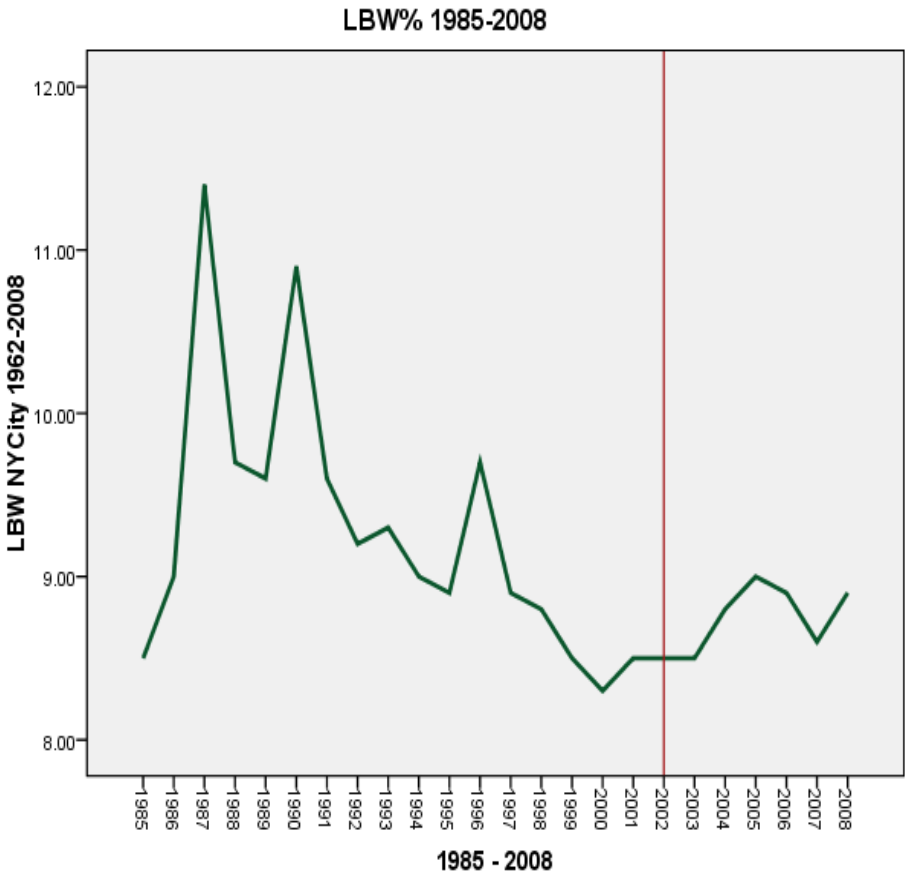
IMR_NYC_6208-Model_1



47 time point years with event line at 2002; LBW ranges from 9.7% in 1962 to 8.9% in 2008



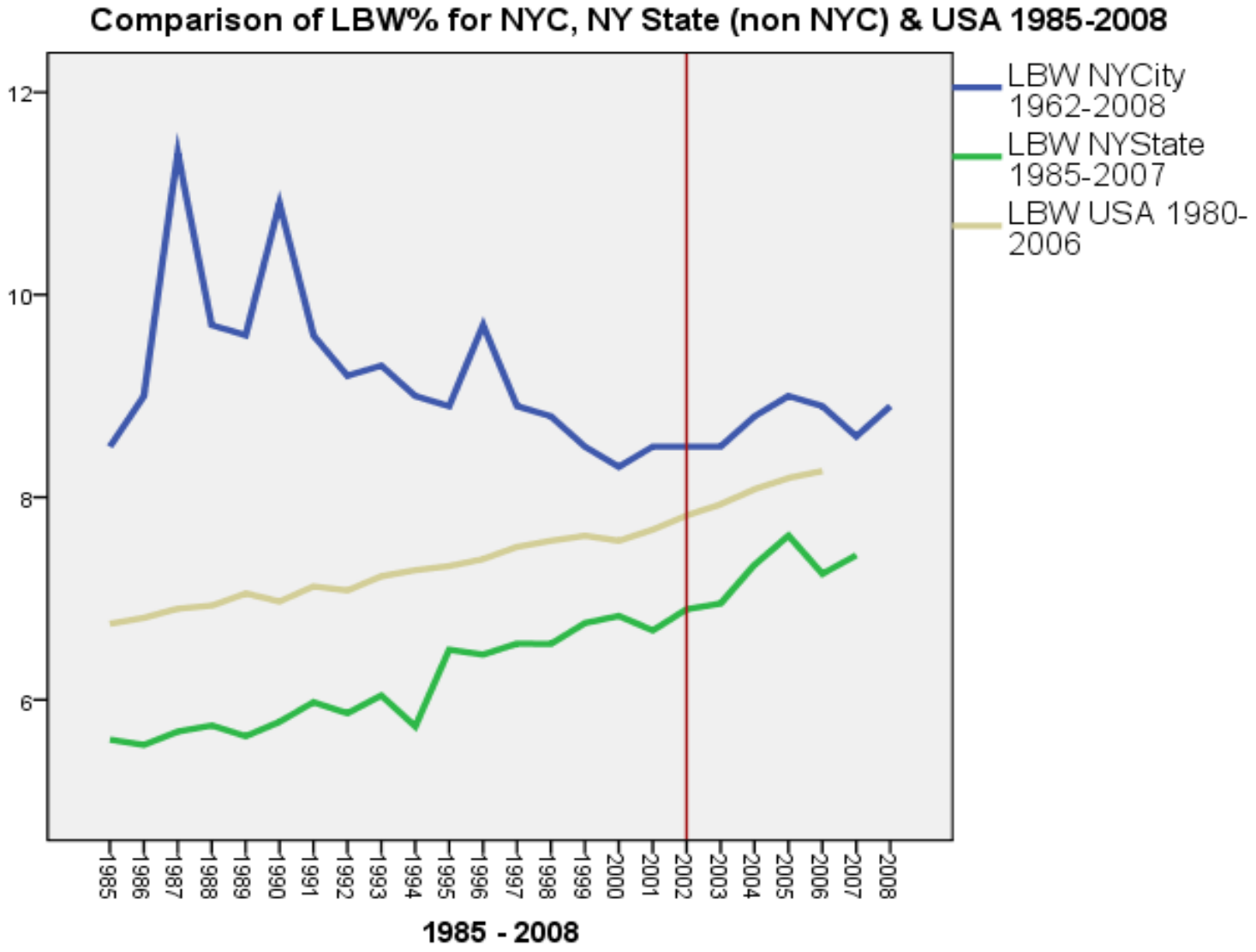
27 time point years with event line at 2002; LBW ranges from 8.5% in 1985 to 8.9% in 2008

Mean (SD)

NYC 9.1 (0.75)

NYS 6.4 (0.65)

USA 7.4 (0.45)



Results

- The hypothesis for this study proposed that the trajectories of wellness observed in the mental health of individuals post disaster could be observed in population health indicators. These trajectories included resistance, resilience, recovery, & dysfunction.
- We found a ***resistant trajectory*** in looking at a time series of birth outcomes of IMR and LBW% pre and post 9/11in NYC; that is, we found no difference in the average yearly rates of these indicators before and after the 9/11 terrorist attack.

Conclusions & Impressions

- Resources & Response – the resource density & comprehensive response to 9/11 may have buffered the population from poor health outcomes
- Mortality & Morbidity – non-resistant health response patterns may have been apparent with less severe indicators
- Trajectory Occurrence – when looking at individual responses, the majority (35% in Mexico, 40% in NYC) fell into the “resistant” group
- Best Data Interval – yearly intervals may not be sensitive enough to detect changes

Next Steps

- We plan to look at quarterly data to determine if a shorter time interval will detect within-year changes in population health indicators
- We plan to look at other indicators (late/no prenatal care, divorce, teen pregnancies) that may reflect overall stress in a community
- We plan to look at indicators in a different community following a similar event (Madrid 2005 bombing)