

# Health Benefit Assessment: Methods for 2012 AQMP Update

Prepared for:  
STMPR AG for the SQ AQMD 2012 AQMP

Prepared by:  
Leland Deck  
Stratus Consulting  
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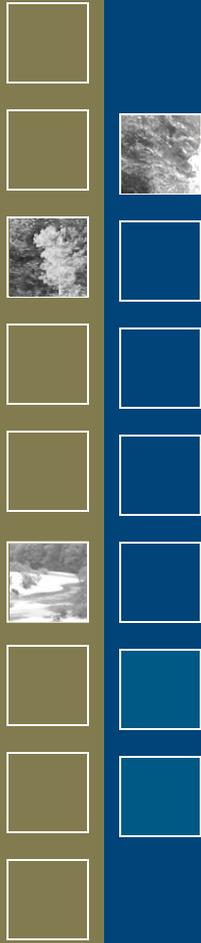
## 6 Critical Components of a Health and Valuation Analysis

- Air Quality Modeling
- Population Forecasts
- Health Effect Categories (“Endpoints”)
- Concentration-Response Risk Functions
- Public Health Data Forecasts
- Health Effect Valuation Functions



## Goals of Revising Methods

- Design analysis to support 2012 AQMP
- Improve use of South Coast specific information
- Reflect new health research and understanding of air quality health issues
- Reflect new economic research and understanding of valuing health risks
- Use more recent data
- Improve communication of methods and results



# Changes in Air Quality Modeling

- Air Quality Model

- 2012 using CMAQ ('07 used CAMx)
- 4 km x 4 km grid system ('07 used 5 x 5)
- Adjusted to 2008 monitors ('07 used '05)



# Changes to Population Forecasts

- Forecasts for 2014, 2023
  - Based on 2005-2009 American Community Survey (ACS) population
  - REMI forecasts for 21 sub-County regions
- Population (by age group) is allocated to 4km x 4km grid based on 2010 Census
  - Age specific population density at 2010 Census Tract level



# Selecting Health Effects to Quantify

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- PM2.5 and NO2
    - ‘12 AQMP targets these 2 pollutants
  - Must have both C-R function, valuation function and any required public health data (e.g., baseline incidence rates)
  - Must be based on published, peer reviewed literature
  - Must have methods used specifically reviewed and approved by an external peer review committee

# Quantified PM2.5 Health Effects

Health Effect	In 2007 AQMP?	Recommended for 2012?
Mortality (adult and infant)	✓	✓
Chronic Bronchitis	✓	✗
Acute Myocardial Infarction	✓	✓
Acute Respiratory Symptoms	✓	✓
Work Loss Days	✓	✓
Hospital Admissions, Cardiovascular	✓	✓
Hospital Admissions, Respiratory	✓	✓
Acute Bronchitis	✓	✓
Upper Respiratory Symptoms	✓	✓
Lower Respiratory Symptoms	✓	✓
Emergency Room Visits, Respiratory	✓	✓
Asthma Exacerbations (“attack”)	✗	✓

# Quantified NO2 Health Effects

Health Effect	In 2007 AQMP?	Recommended for 2012?
Respiratory Symptoms	x	✓
Hospital Admissions, Respiratory	x	??
Emergency Room Visits, Respiratory	x	??
Asthma Exacerbations (“attack”)	x	✓



## Mortality C-R Functions in '07 AQMP

- 2007 used an average from 3 studies
  - Pope et al. (2002)
    - National ACS cohort RR=1.06
  - Laden et al. (2006)
    - Harvard 6-Cities RR=1.15
  - Jerrett et al. (2005)
    - Los Angeles area data from ACS
    - RR = 1.158



# Candidate Mortality C-R Functions for '12 AQMP

- - Krewski et al. (2009)
    - National ACS cohort RR=1.06
  - Laden et al. (2006) RR=1.15
  - Roman et al. (2006, 2008) expert elicitation
    - Use consensus function per EPA 812 Study. RR ~ 1.11
  - Krewski et al. (2009) Los Angeles function
    - Subset of ACS cohort study. RR = 1.197



## Why Krewski et al. (2009) LA study?

- Expands on Jerrett et al. (2005)
- Based on PM2.5 monitors from 2000
  - 24 FRM monitors in LA metro area
  - Includes 6 “super site” species monitors
  - By using 2000 monitors estimation is based on PM changes resulting from targeted PM2.5 reductions
- Used by EPA in the 2010 Risk Assessment (part of PM2.5 process)



# Valuing Health Effects

- Economic Science preferred methods
- Willingness to Pay (WTP) based demand for risk reduction
- Local estimates
- Specific to age and source of risk
- **Can't Always Get What You Want**

# Reality of Valuation Functions

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# What Changes for 2012 Valuations?

- **EVERYTHING**

- Analytical date of matters

- Basis year of '12 AQMP benefits values = 2005

- 2 implications of basis year

- Inflation. All analysis based on 2005 prices

- Income. Will be based analytical year

- WTP increases with real income

- Income elasticity of demand

- Real income growth: 2010 federal estimates

# Valuing Fatal Risk Reductions “Value of Statistical Life” or VSL

- VSL is misnomer, but entrenched in literature
- Concept is WTP for a small reduction in a fatal risk
  - E.g., WTP for a  $10^{-6}$  risk reduction in probability of dying is in range of \$1 to \$10
- If 1 million people will experience a  $10^{-6}$  risk reduction
  - One expected death (or “statistical death”)
  - Sum of all WTP = \$1 to \$10 million = VSL









## Issues with Current EPA VSL Policy

- Few stated preference studies
- Both wage hedonic and stated preference studies methods have changed a lot
- Clear trend in recent stated preference studies have found lower values since '80s
- Age of studies makes adjusting for inflation and real income growth dominate the estimates of values in 2010 or future
- Viscusi no longer recommends his 1992 paper as the basis of VSL for policy purposes



