


# Secondhand Smoke and Nevada Casino Workers: Exposure and Health Risks

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# Estimated Health Impact from ETS Exposure in U.S.

42,500-67,500 LIVES LOST EACH YEAR DUE ONLY TO EXPOSURE TO ETS

- 3,000 LUNG CANCER DEATHS
- 37, 000-62,000 CARDIAC DEATHS
- 6,000 ACCIDENTAL DEATHS IN CHILDREN
- 2,000 SUDDEN INFANT DEATH SYNDROME (SIDS)
- IMPAIRED COGNITIVE ABILITY FROM *IN UTERO* EXPOSURE
- REDUCTION IN IQ TESTING
- LOW BIRTH WEIGHT (9,700-18,600)
- RESPIRATORY DISEASES
  - ASTHMA INDUCTION (8,000-26,000 NEW CASES/YEAR)
  - ASTHMA EXACERBATED CASES (400,000-1,000,00)
  - LRI/URI/BRONCHITIS/PNEUMONIA
    - 150,000-300,000 CASES
    - 136-212 DEATHS
- OTITIS MEDIA (700,000-1,600,000)

# 2004 CDC Health Advisory on ETS Exposure

- Two fold increase in risk of heart attack.
- Avoid all places that allow smoking.
- 30 minute exposure causes substantial biological damage.
- Indistinguishable from active smoking

## **Public Health Conclusion**


“Smoke-free environments can prevent acute heart attacks in non-smokers.”

# Physics as Understood by Restaurateurs and Casino Executives

NON SEQUITUR



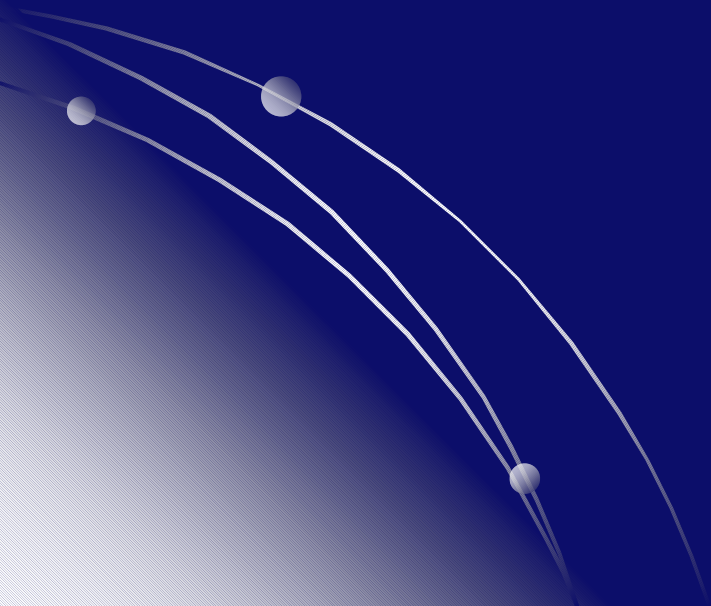
# ETS Constituents

- Over 4000 chemicals have been identified so far in Environmental Tobacco Smoke.
  - To date, 69 chemicals identified in ETS are either known, probable or possible cancer causing agents.
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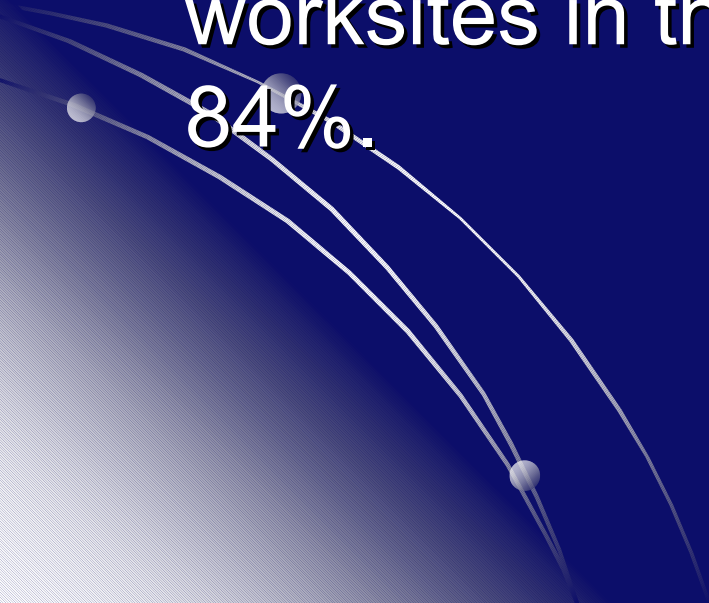
# ETS Constituents

- Including
  - Nitrosamines
  - Hydrogen Cyanide
  - Benzene
  - Formaldehyde
  - Toluene
  - Acrolein
  - Poly Aromatic Hydrocarbons PAHs ( benzo-a-pyrene)
  - Metals (Cadmium, nickel)
  - Carbon Monoxide
  - Nicotine

# Why is ETS such a Major Problem for Nevada?



# Nevada Facts

- Nevada has a very high smoking rate at 25.2%— 12<sup>th</sup> in the Nation.
  - Nevada has the fewest smoke-free worksites in the nation, 48%. Utah #1 at 84%.
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# Nevada Facts

- Tourism is Nevada's biggest industry and employer. The gaming industry dominates Nevada's tourism industry.
- The gaming industry does not wish to have any restrictions placed on its clientele and vehemently opposes any anti-smoking legislation.


# Nevada Facts

- It is highly unlikely that any legislation will be forthcoming in the near future which would restrict smoking in Nevada gaming establishments. There are two antismoking initiatives on the ballot for 2006 but neither includes casino gaming floors.
- A large percentage of Nevada's workforce will continue to be exposed to second-hand smoke in the workplace.

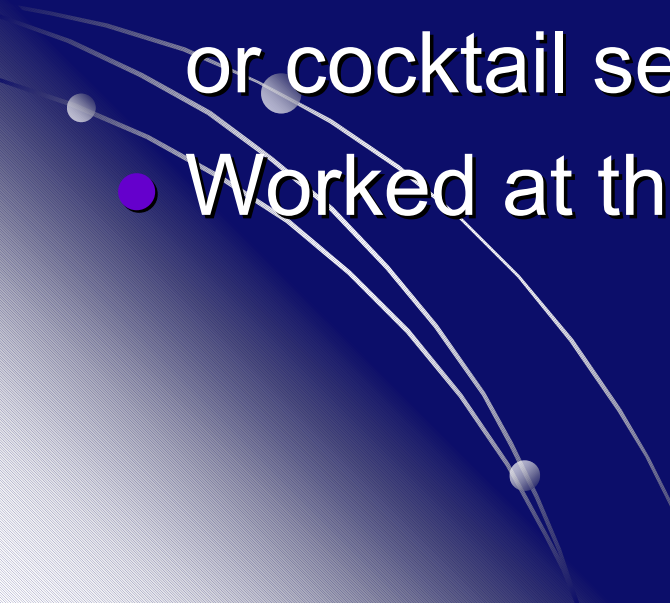
# Nevada Environmental Tobacco Smoke and Health Study

- Phase III Clinical Trial
  - Funded by the National Institute of Environmental Health Sciences (NIEHS)
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# General Study Hypotheses

- Casino Employees are a workforce highly exposed to ETS.
  - Exposure to high levels of ETS will increase their risk of developing chronic diseases such as cancer and cardiovascular disease.
  - Antioxidant supplements may provide some protection from ETS health effects.
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# Study Participants

- 125 Healthy male and female non-smokers between the ages of 25-70.
  - Did not live with a smoker past 3 years.
  - Worked as a casino floor worker, bartender or cocktail server (at least 20 hours/week).
  - Worked at their job for at least 2 years.
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# Overall Study Design

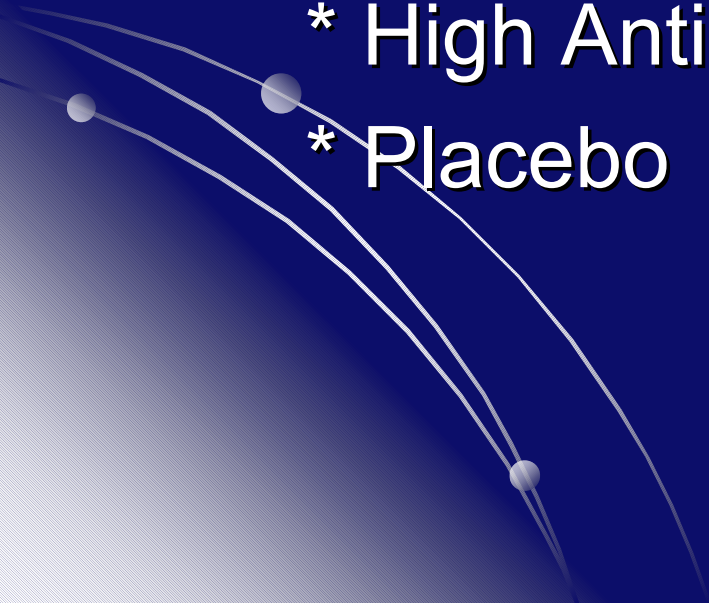
- Collect baseline health data on non-smoking casino floor workers, bartenders and cocktail servers working in the Las Vegas and Reno areas.

- \* Blood Samples

- \* Questionnaires (Sick-day Calendar)

- \* Diet Analyses

# Overall Study Design

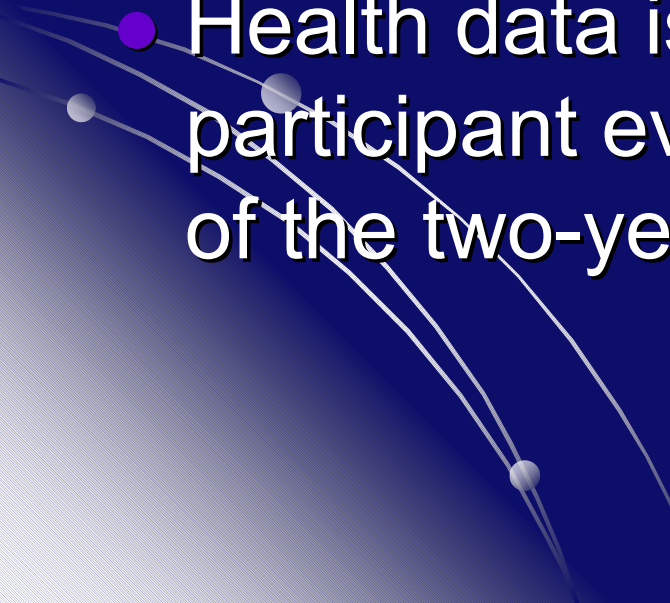
- Randomize participants into one of three antioxidant supplementation groups.
    - \* Low Antioxidant Supplementation
    - \* High Antioxidant Supplementation
    - \* Placebo
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# Study Antioxidant Supplements

Antioxidant      Low      High

● Vitamin C	75 mg	1000 mg
● Vitamin E	15 mg	500 mg
● Selenium	60 ug	200 ug

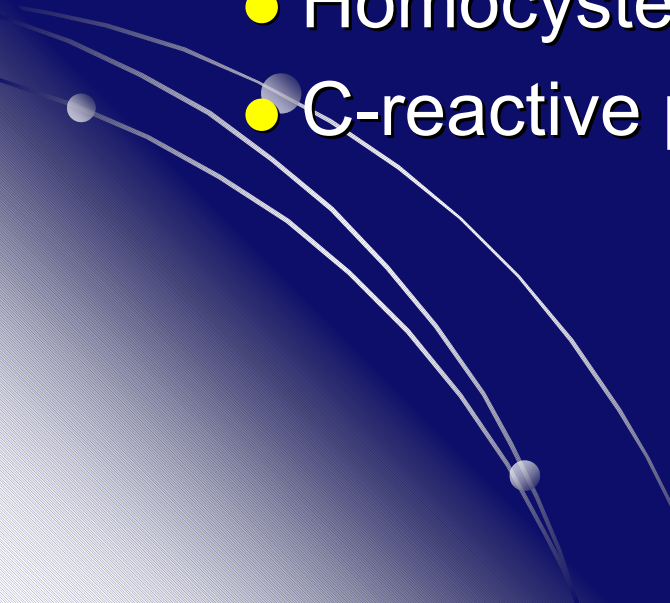
# Overall Study Design

- Participants take their antioxidant supplementation for a two-year period.
  - Health data is collected from each participant every 6 months over the course of the two-year study.
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# Blood Analyses

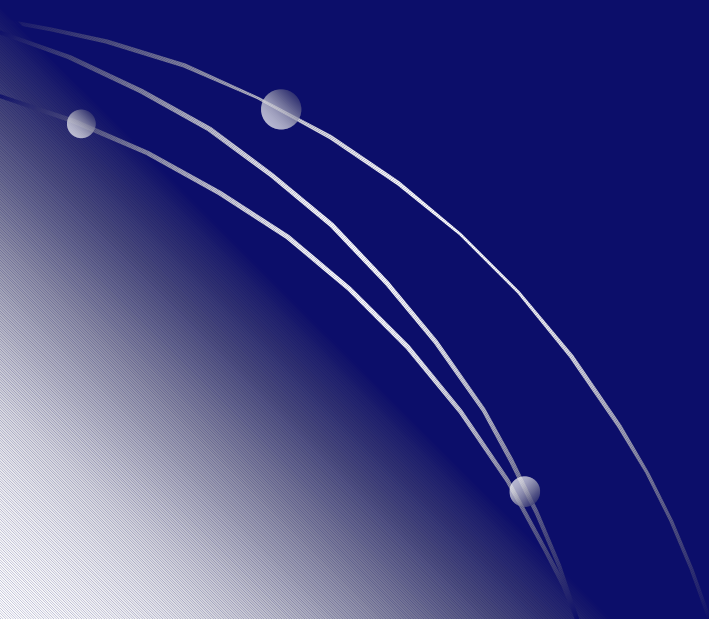
- **Oxidative Stress Biomarkers**
  - Superoxide Dismutase
  - Glutathione Peroxidase
  - Plasma total antioxidant capacity
  - Plasma  $\alpha$  and  $\gamma$ -tocopherol
  - Plasma  $\alpha$  and  $\beta$ -carotene
  - Plasma Vitamin C levels
  - Oxidized LDL
  - DNA damage – total and 8-OHdG

# Blood Analyses

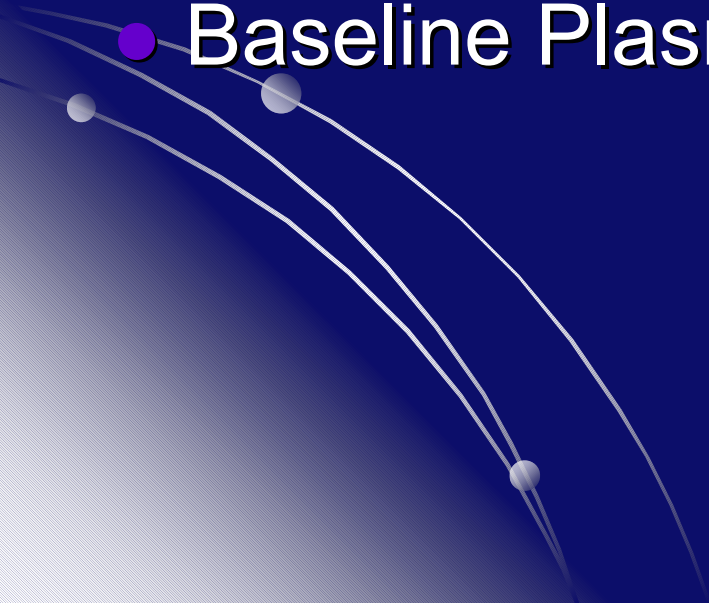
- Biomarkers of Coronary Heart Disease
    - Total Cholesterol
    - LDL
    - HDL
    - Homocysteine
    - C-reactive protein
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# Blood Analyses

- Biomarkers of Exposure
  - Plasma Cotinine Levels



# Preliminary Results

- DNA damage analyses on a subset of 50 randomly selected subjects
  - Baseline Plasma Cotinine Values
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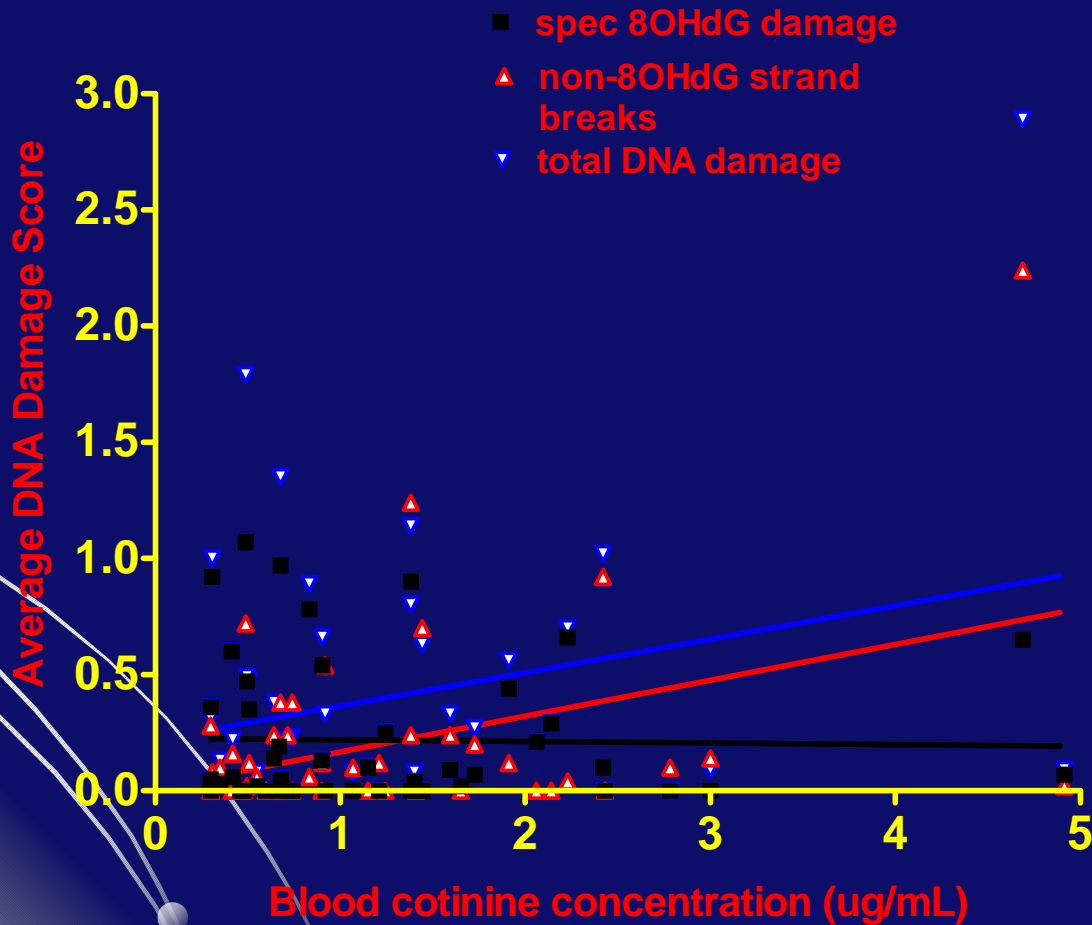
# Assessment of DNA Damage In Whole Blood Using the Single Cell Gel Electrophoresis or Comet Assay

- Total DNA damage
- 8-hydroxy-2'-deoxyguanosine (8OHdG)

(8-oxoguanine glycosylase – cleaves 8-OHdG-DNA lesions)

Flare™ Assay Kit (Trevigen, Gaithersburg, MD)

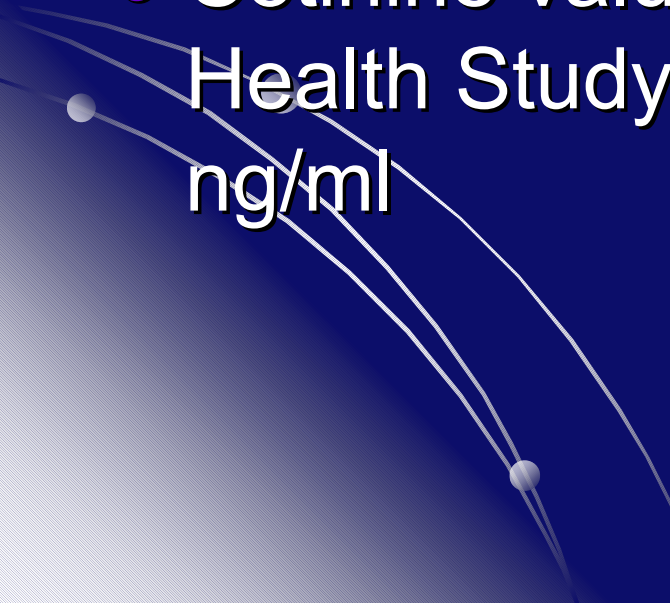
# DNA Damage vs Cotinine



# DNA Damage by Gender

	Males	Females	P Values (T-test)
8-OHdG Damage Score	0.58	0.05	0.0005
Total DNA Damage Score	0.9	0.15	0.0163

# ETS Exposure - Cotinine

- NHANES Cotinine values for non-smokers exposed to workplace ETS – 0.32 ng/ml
  - Cotinine values from Nevada ETS & Health Study (Baseline Values) – 1.14 ng/ml
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# Casino Employee Cotinine Values

- Trout et al. – NIOSH Study- JOEM 40:270—276 (1998)
  - New Jersey Casino
  - Cotinine values from 17 dealers following work shift.
  - Average Value 1.94 ng/ml: Geometric mean 1.83 ng/ml

# Estimated Nevada ETS & Health Serum Cotinine Levels

- Estimated serum cotinine values using an 18 hour metabolic half-life estimate for serum cotinine and time between end of workshift and clinic visit:

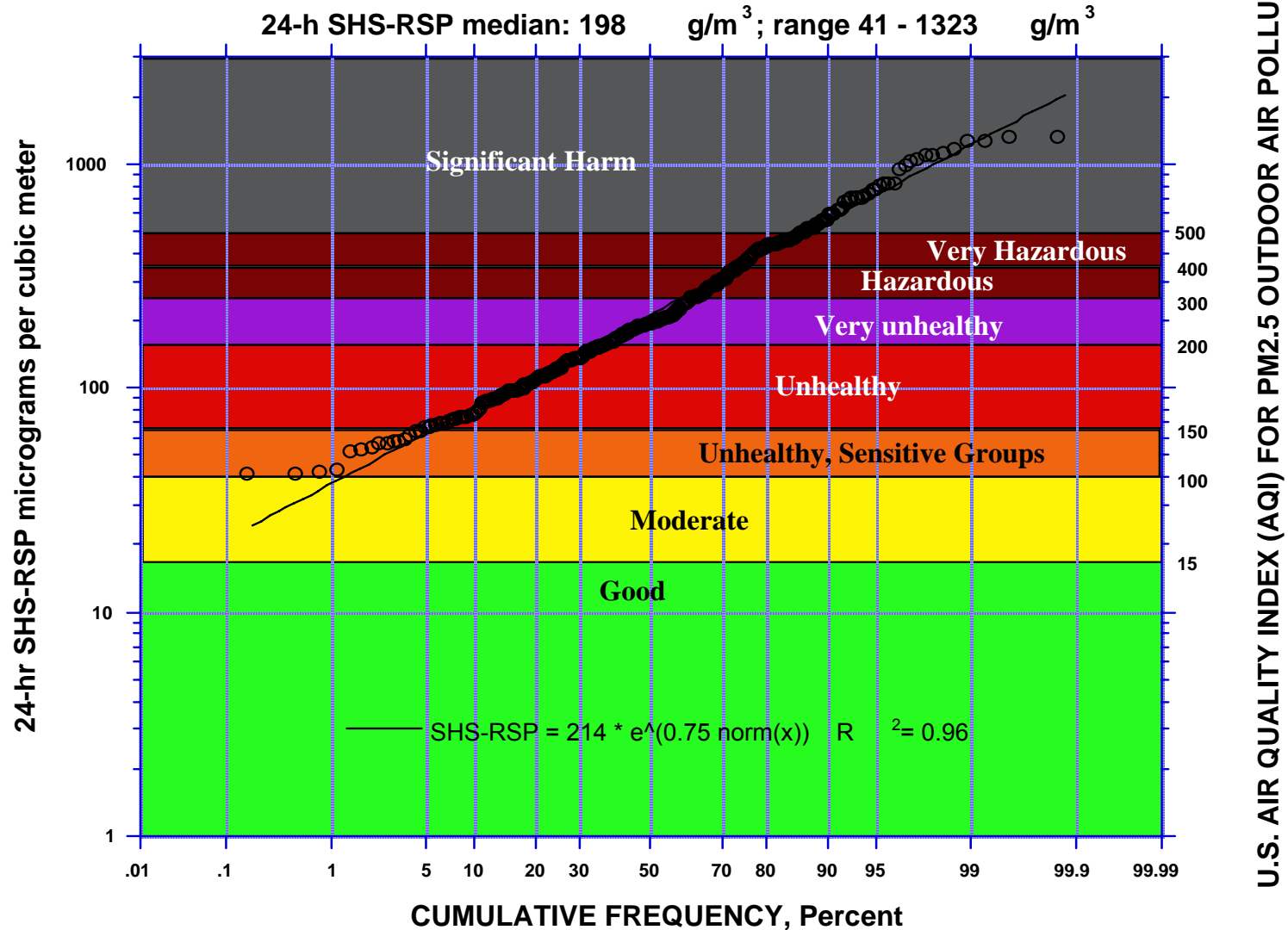
Study	Ave Cotinine Value ng/ml	Geometric Mean Cotinine Value ng/ml
Trout et al	1.94	1.83
Nevada ETS	1.96	1.58

# Correlating Serum Cotinine Levels to Atmospheric ETS Respiratory Particle Concentration

- Repace, Al-Delaimy and Bernert, JOEM 47:1-14 (2005).
  - Correlated ETS respiratory particle concentration to serum cotinine levels using exposure duration, default pharmacokinetic parameters and respiration rates.
- Using this analyses on the cotinine values from our study, Repace then plotted them against the air quality index to determine the indoor air quality these workers were exposed to.

# AQI for Las Vegas Casino Workers: Unhealthy to Significant Harm Due to Secondhand Smoke Pollution

C. Pritsos Nevada Casino Worker SHS-RSP Inhaled Dose Levels vs. Air Quality Index (AQI)



# Preliminary Results

- ETS exposure results in dose-dependent total DNA damage.
- Males experienced greater total and oxidative DNA damage than females
- Plasma Cotinine Values demonstrate that this Nevada workforce is more highly exposed to ETS (4X) than other ETS exposed workforces (NHANES).
- Exposure levels range from Unhealthy to Significant harm levels based upon U.S. Air Quality Index Standards for Outdoor Air.

# Collaborators

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