

Pesticides exposure among children 5-14 years: results of the National Health Survey of Pakistan

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Pesticide use in the World

- Pesticides used in agriculture, horticulture, forestry and livestock production
 - Expenditures totaled >\$30 billion (2001)
 - Amount used >1.5 million tons (2001)

(Wood McKenzie's agrochemical service. The World market in 2000)

- Majority of pesticides are toxic to humans and environment
- Some banned pesticides (DDT) are still being used

Contamination of air, soil and water

- **Air:**
 - Contaminated during spraying operations (particles travel great distances)
 - Treatment of houses with pesticides to control disease vectors
- **Soil:**
 - Spray on crops (organochlorines persist in soil for years)
- **Water**
 - Dumping of excess pesticides after spraying
 - Accidental spillage
 - Run-off from agriculture land

Exposure of humans to pesticides

- Acute poisoning (1-3 million/yr)
 - Mortality is 1-9%
- Attempted or successful suicide – 500,000 deaths in SEA & W Pacific alone (2000)
- Majority of unintentional pesticides poisoning occurs in farm workers and their families
 - Applying/spraying
 - Mixing/handling
 - Entering a pesticide treated area
 - Often pesticide applied only days or hours before harvesting

Health effects of occupational pesticide exposure

- Acute effects:
 - Chemical burns of the eye
 - Skin damage
 - Neurological effects
 - Liver effects
- Chronic exposure
 - Reproductive problems
 - Risk of cancer
 - Delayed neurological and psychological effects
 - Effects on immune function

Pesticide use in Pakistan

- 70% population in Pakistan are related to agriculture
- Trend of increasing pesticides use
 - 665 metric tons in 1980
 - 11,2928 metric tons in 2004
- Pesticide use is concentrated in certain crops - cotton

Methods

- National Health Survey of Pakistan 1990–94 is a nationally representative survey of the households
 - Population 132 million (1998 census)
- A two-stage stratified design
 - 8 strata: four provinces, urban/rural
 - 80 primary sampling units (PSU) of 200-250 households [30 HH from each = 2400 HH)
- 5990 children of 5-14 years [total sample = 18,315]
- Weighted estimates were computed adjusting for complex survey design using *surveyfreq* and *surveylogistic* option of SAS 9.1 software
- Post-hoc power calculations

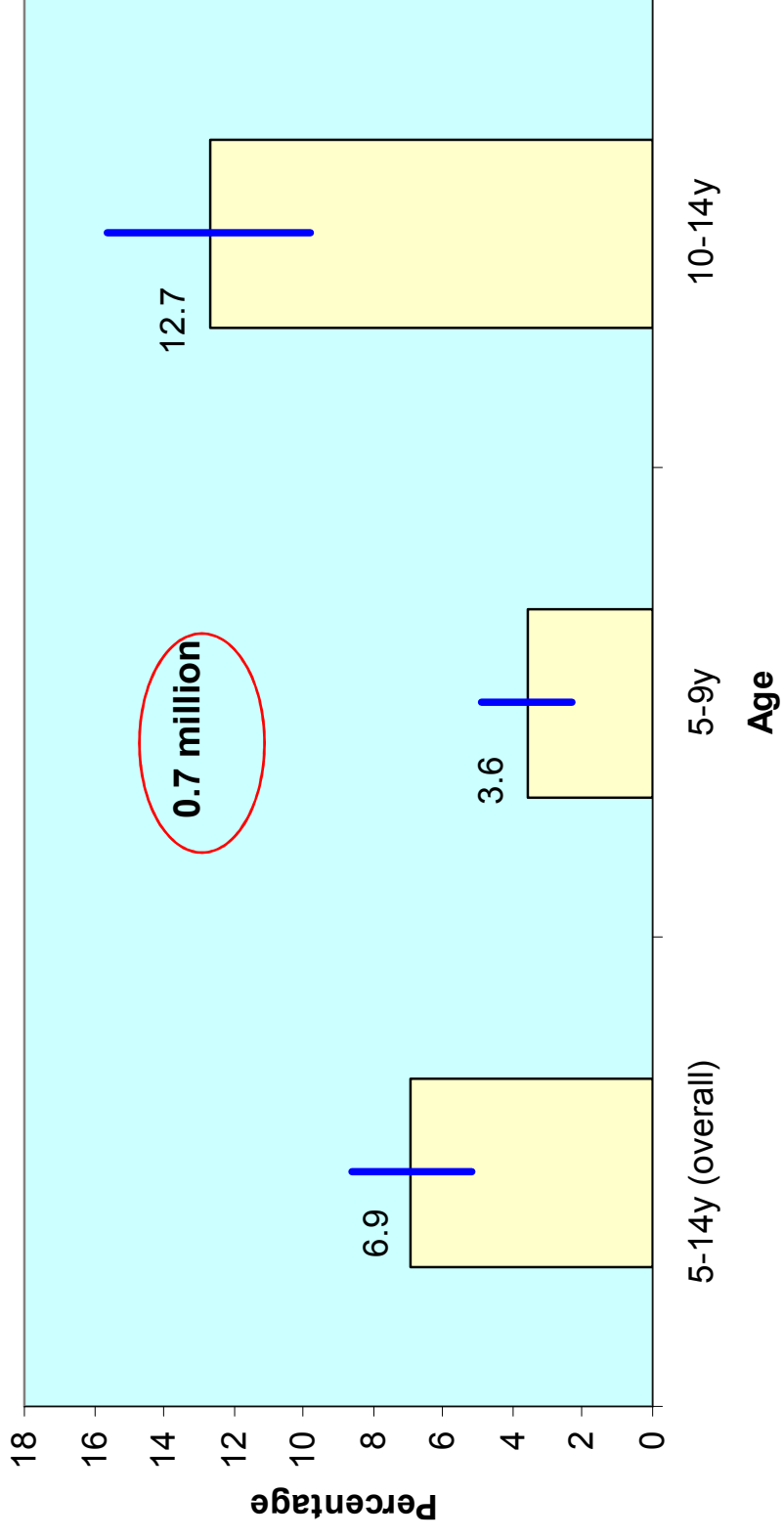
Analysis and Estimates

- Proportion of farm workers among 5-14 years in Pakistan
- Exposure with pesticides was assessed:
 - Nature of farm work
 - Exposure from drinking water
 - Frequency and duration of application
 - Non-occupational (non-farming) use of pesticides
- Gender differential in exposure

Proportion of farm workers among 5-14 years old children, and by age groups, in Pakistan (NHSP, 1990-94)
 (n=5990)

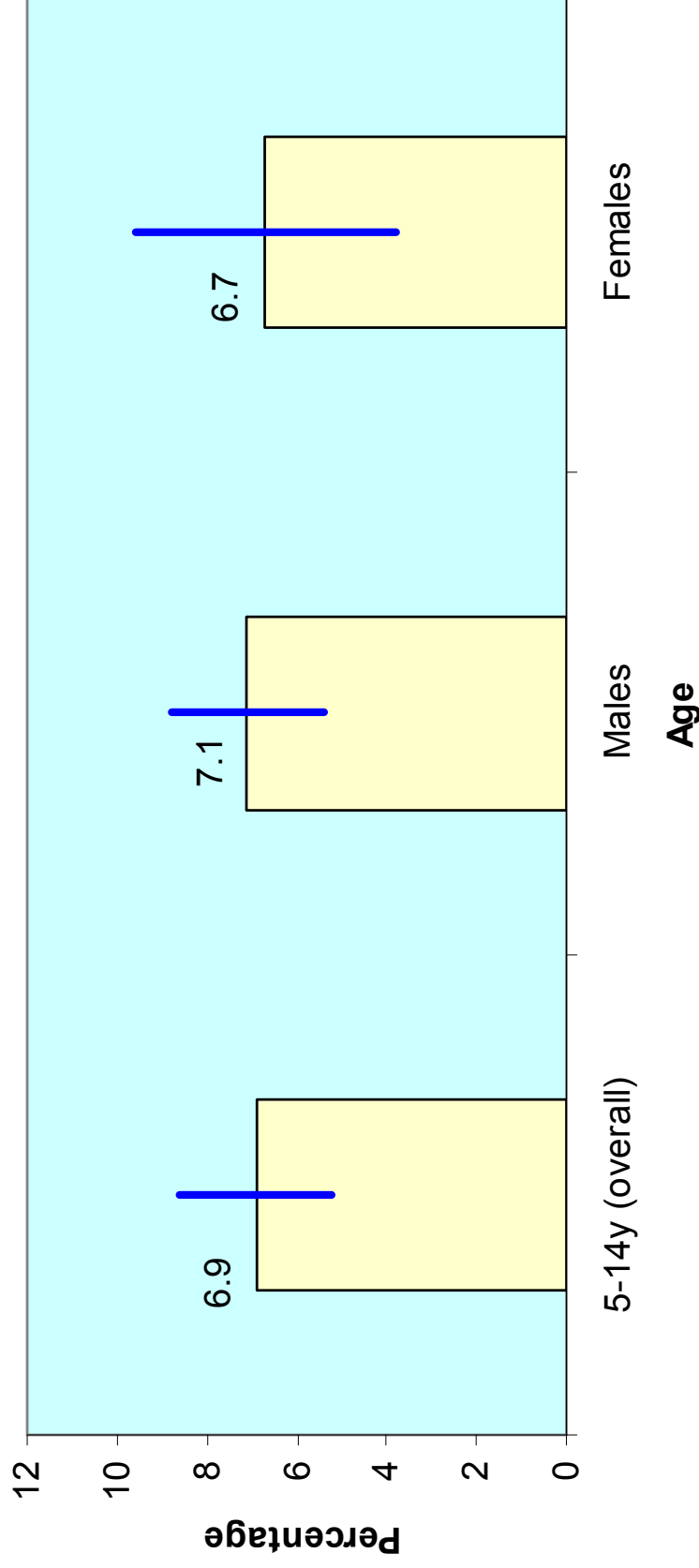
2.2 million

0.7 million



— = 95% Confidence Interval

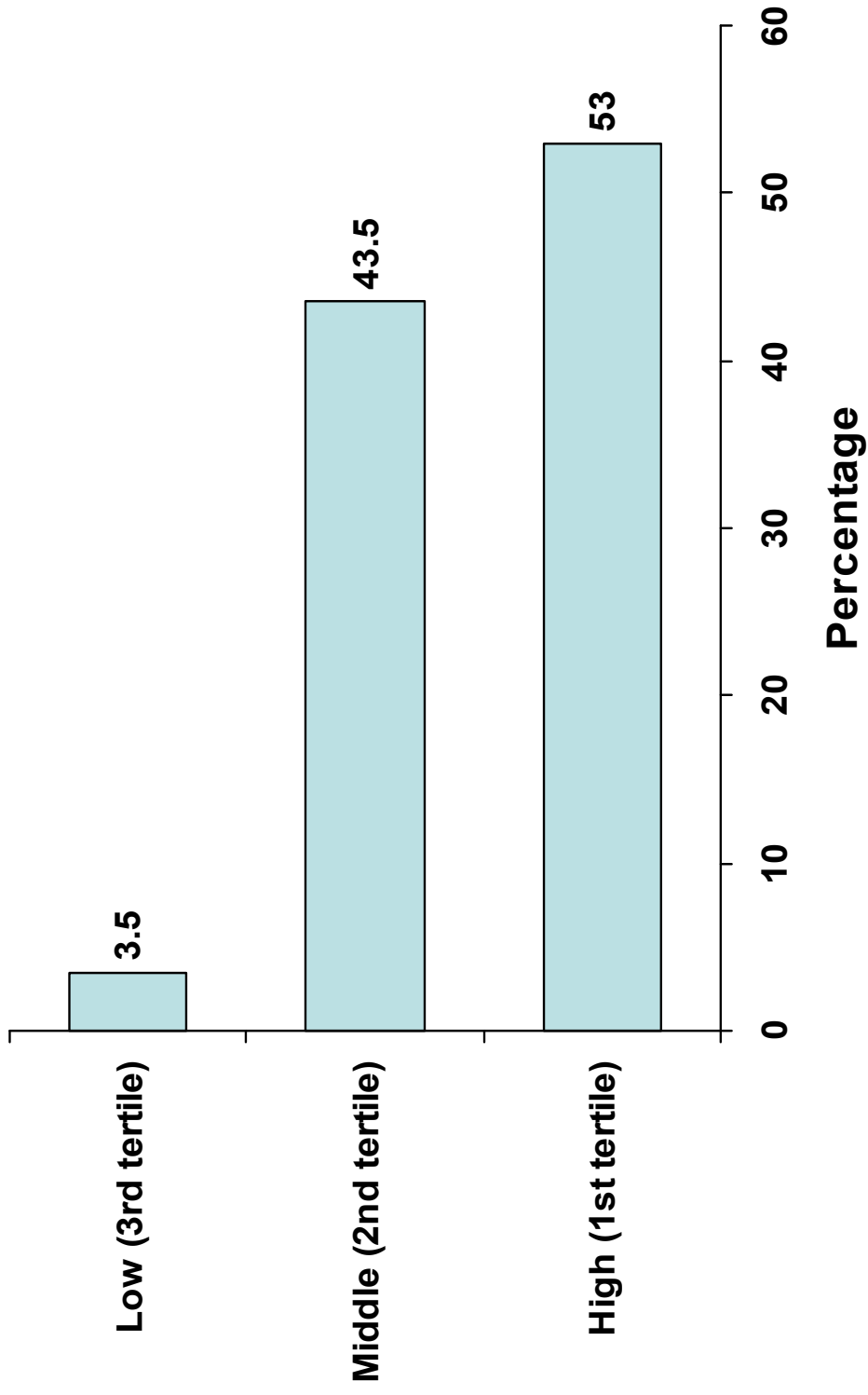
**Proportion of farm workers, distribution by gender,
among 5-14 years old children in Pakistan (NHSP, 1990-
94)
(n=5990)**



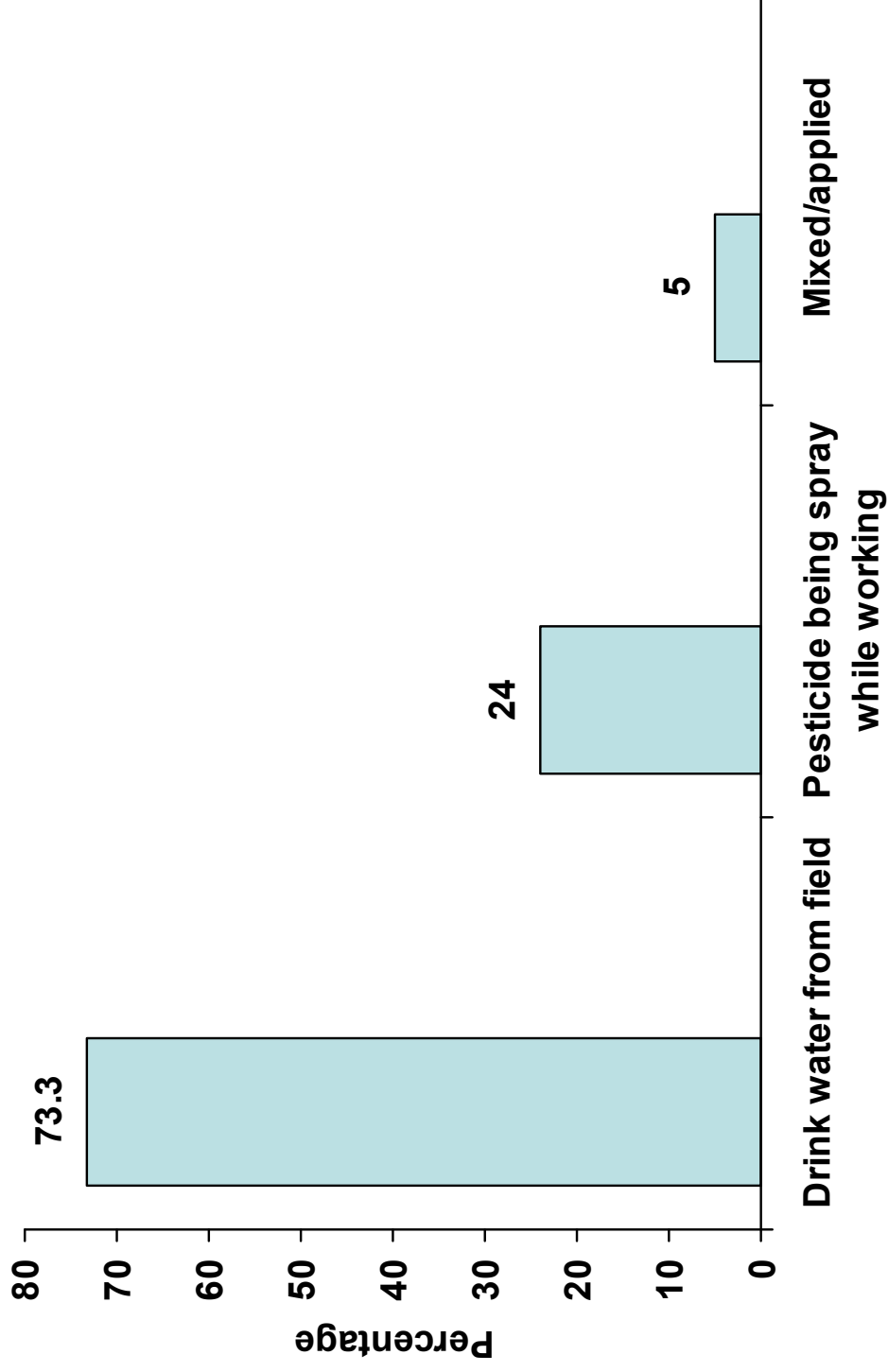
— = 95% Confidence Interval

Duration of farming = 3.7 (SD2.4) years
Time during the year = 7.7 (SD4.0) months

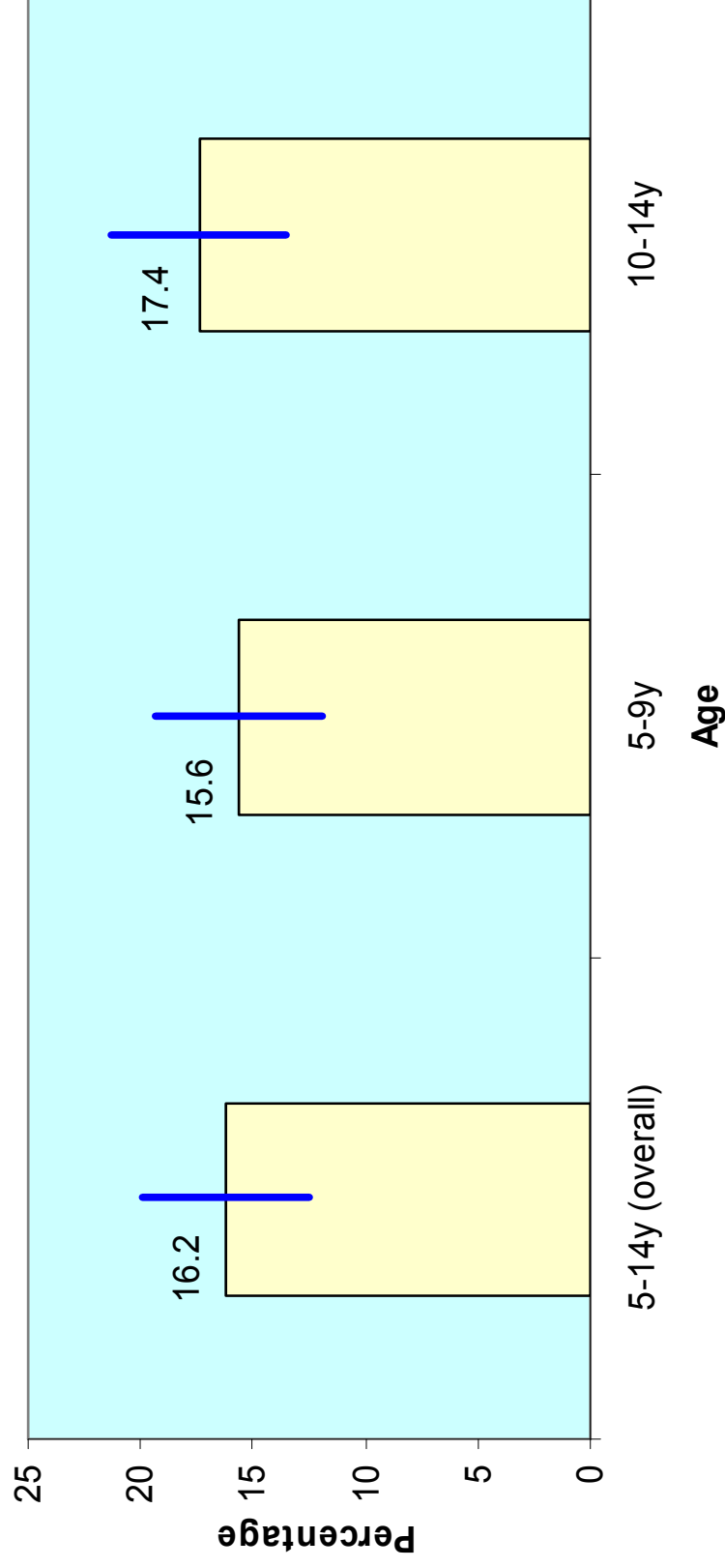
Socioeconomic Status of 5-14 year old farm workers in Pakistan (Community Development Index)



Exposure to pesticide during farming among 5-14 years in Pakistan (NHSP, 1990-94)

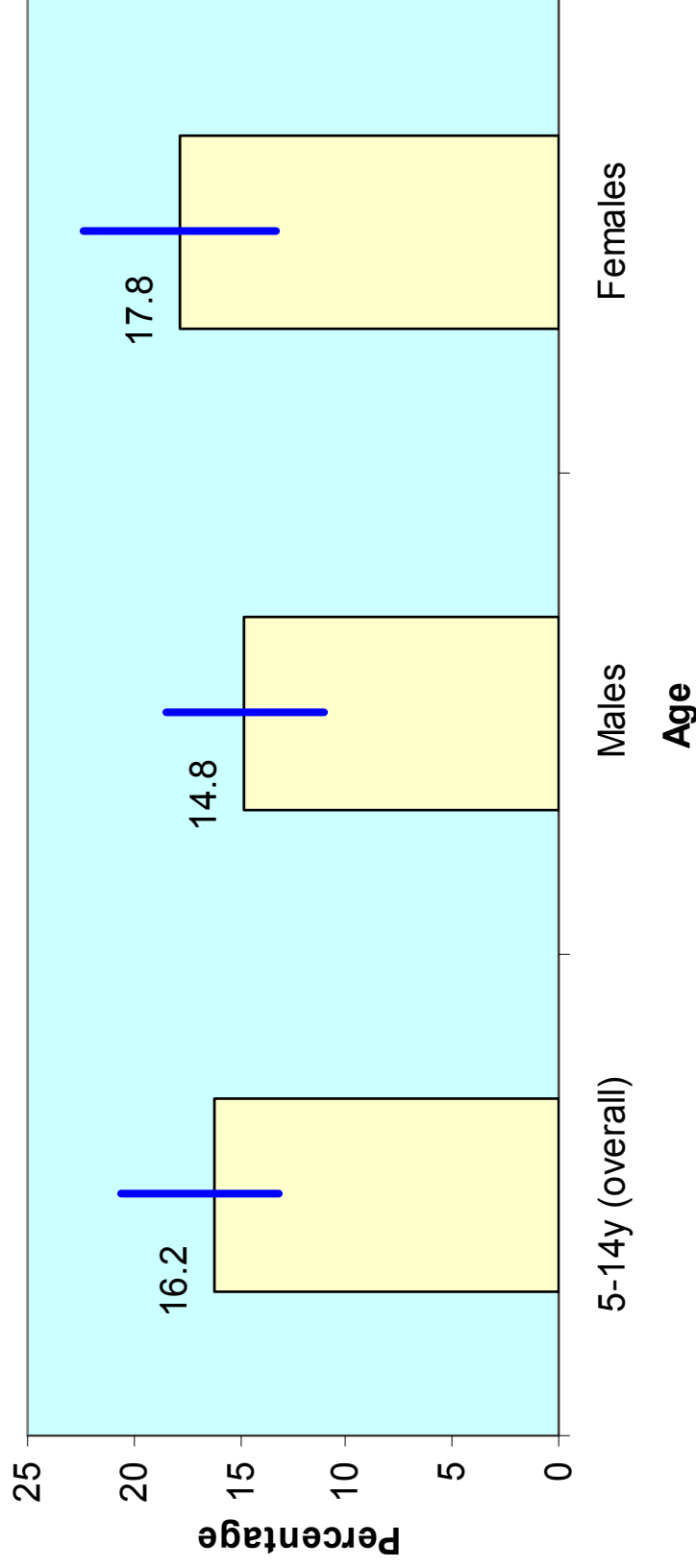


**Pesticides use other than farming, distribution by age
among 5-14 years old children in past 12 months in
Pakistan (NHSP, 1990-94)
(n=5990)**



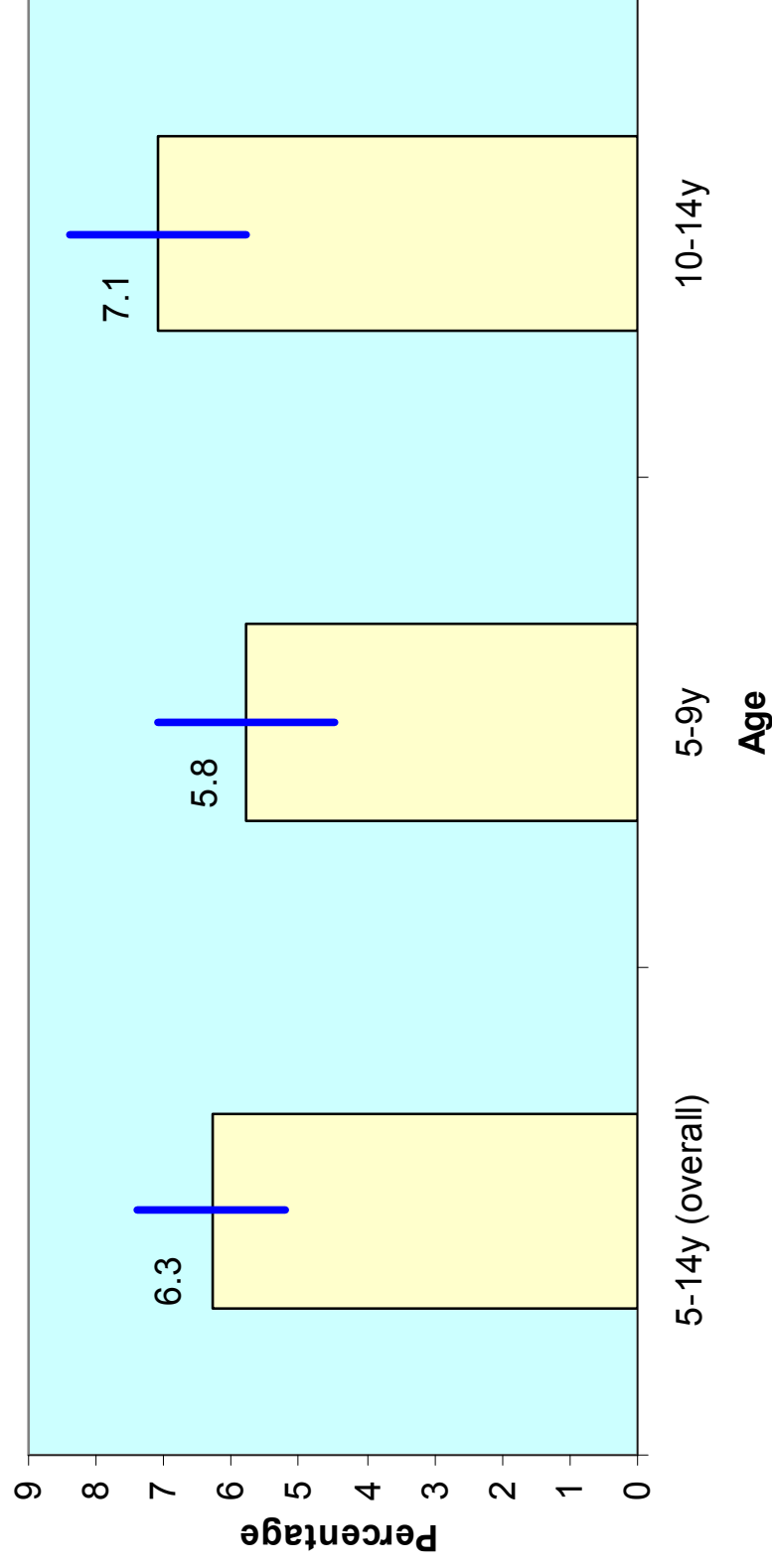
— = 95% Confidence Interval

Pesticides use other than farming, distribution by Gender, among 5-14 years old children in past 12 months in Pakistan (NHSP, 1990-94)
(n=5990)



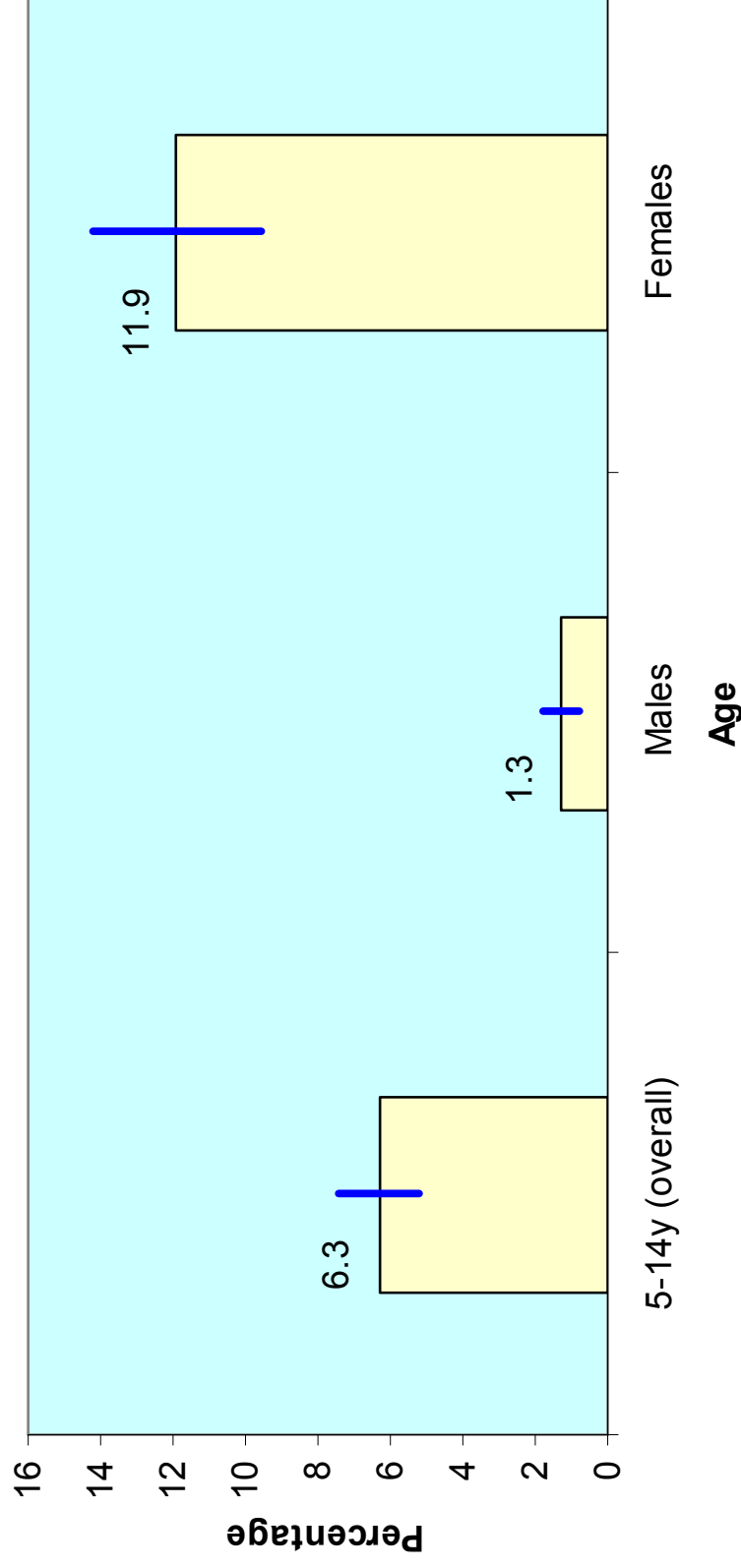
— = 95% Confidence Interval

DDT use for control of head lice, distribution by age among 5-14 years old children in past 12 months in Pakistan (NHSP, 1990-94)
(n=5990)



— = 95% Confidence Interval

DDT use for control of head lice, distribution by Gender, among 5-14 years old children in past 12 months in Pakistan (NHSP, 1990-94)
(n=5990)



— = 95% Confidence Interval

Discussion

- Approximately 3 million underage children are exposed to pesticides through farming in Pakistan
 - Some are also involved in mixing (heavy exposure)
- Pesticide is also commonly used for in households for non-farming purposes
 - Control of head lice, particularly among female child

Recommendations

- Characterize exposure levels among children
- Occupational and all non-occupational sources should be considered for further studies
- Time-activity analysis could provide information about age-specific exposure pathways
- Population-based surveys of pesticide exposure using biomarkers (such as urine) should be conducted

Recommendations

- Determine the predictors of pesticides exposure in the body and home (determinants)
- Follow up children for health effects