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# Adjusting Census Figures



# Why consider adjusting census figures ?

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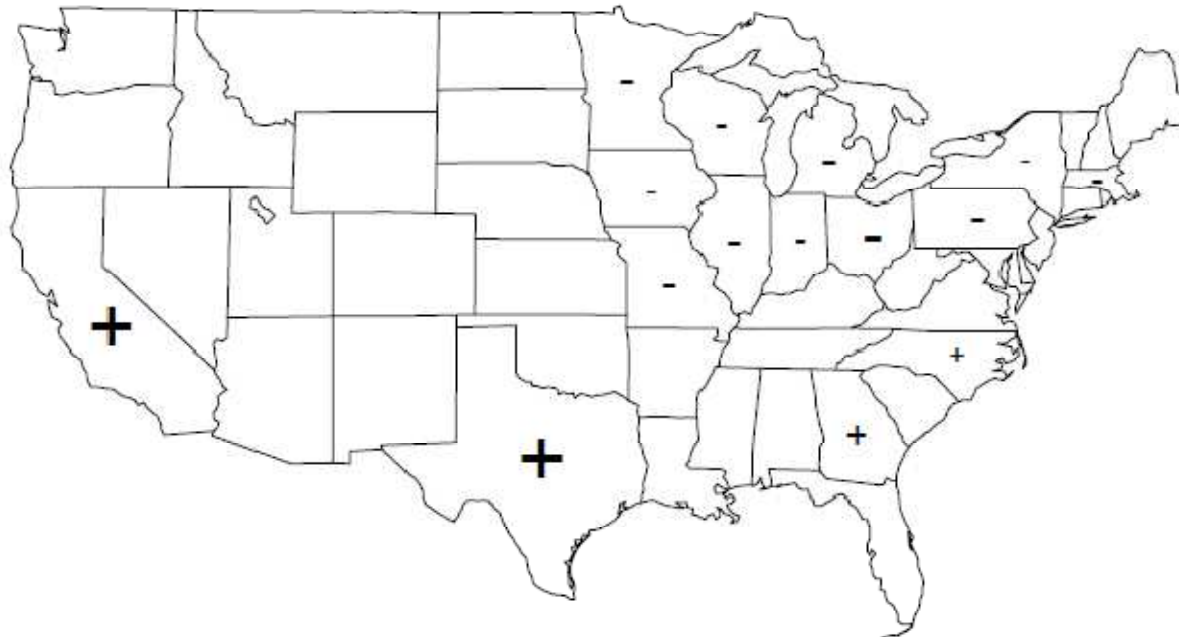
- ❑ Errors may be substantial and the validity of the census counts is in question
- ❑ Coverage of certain population groups or geographic areas may be particularly deficient
  - Where census counts are used to determine the allocation of services, funds, political representation etc., such errors can have an effect on resource distribution
  - For allocation purposes, the distribution of the population matters more than absolute numbers
  - *So, if undercoverage is uniform across demographic and geographic groups, there are no consequences in terms of equity*
- ❑ To have a correct estimate of the population as a basis for future intercensal estimates and projections



# Implications of census adjustment for geographic distribution of population

- States that would have gained and lost population if 2000 US census had been adjusted based on the results of the PES

Figure 1. ACE Adjustment: State Share Changes Exceeding 50 Parts Per Million<sup>5</sup>



Source: David Freedman and Ken Wachter. 2002. *On the likelihood of improving the accuracy of the census through statistical adjustment.*



# What to adjust?

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- Census results
  - Total population, population by administrative area (state, region, ...)?
  - Main distributions (by state, sex, age...)?
  - All the database, in order to adjust all potential distribution?



# How to adjust? (1)

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- ❑ Depending on the range of the evaluation programme associated with the census, NSO may carry out more than one type of study to evaluate the census
- ❑ Combining the estimates has the advantage of taking the best characteristics to counterbalance weaknesses in the evaluation methods
  - For example, estimates from demographic analysis may only provide national totals, but those may be considered better estimates than those estimated from PES
  - PES may provide more geographical detail than demographic methods

Source: US Census Bureau, 1985. *Evaluating Censuses of Population and Housing*

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## How to adjust? (2)

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- ❑ There are several techniques to adjust census figures
  - Coverage rate can be directly used to adjust population size
  - Synthetic estimation and regression model permit modeling the distribution of the undercount at the geographic level appropriate to the measurement technique
    - ❑ The model obtained is used to allocate the undercount to lower levels of geography or to areas

Source: US Census Bureau, 1985. *Evaluating Censuses of Population and Housing*

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## How to adjust? (2)

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- Synthetic estimation - estimates persons missed as a percent of total estimated population for various demographic subgroups –example for age and sex- at a specified geographic level
  - The method takes the undercount at high levels of geography and distributes it proportionally at lower levels of geography

Source: US Census Bureau, 1985. *Evaluating Censuses of Population and Housing*

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## How to adjust? (2)

$$\hat{U}_{ijk} = \frac{x_{ijk} U_{ij}}{\sum_k x_{ijk}}$$

$U_{ij}$

Undercount for age i and sex j at the national level

$\hat{U}_{ijk}$

Estimated undercount for age i and sex j for area k

$x_{ijk}$

Enumerated persons for age i and sex j for area k

*Guarantees that undercount at lower levels will sum to undercount at more aggregated levels*

Source: US Census Bureau, 1985. *Evaluating Censuses of Population and Housing*





## How to adjust? (3)

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- Regression techniques – fit a regression model to the undercount estimates at a set geographic level. The estimates are generated in a way similar to that used for synthetic estimation, applying the coefficients estimated at higher geographic levels to characteristics and variables observed in lower geographical levels.
  - Counts at lower levels are not guaranteed to sum to the counts at higher levels

Source: US Census Bureau, 1985. *Evaluating Censuses of Population and Housing*



# Adjustment for the purpose of population estimates/projections

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- ❑ If estimates of census error are made available, census results can be adjusted for specific analyses at the discretion of the analyst, such as for population estimates and projections
  - Based on the result of census evaluation, population size can be adjusted to take into account under- or over-coverage



# Adjustment for the purpose of population estimates/projections

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- Distribution of population by age can be adjusted to take into account age misreporting

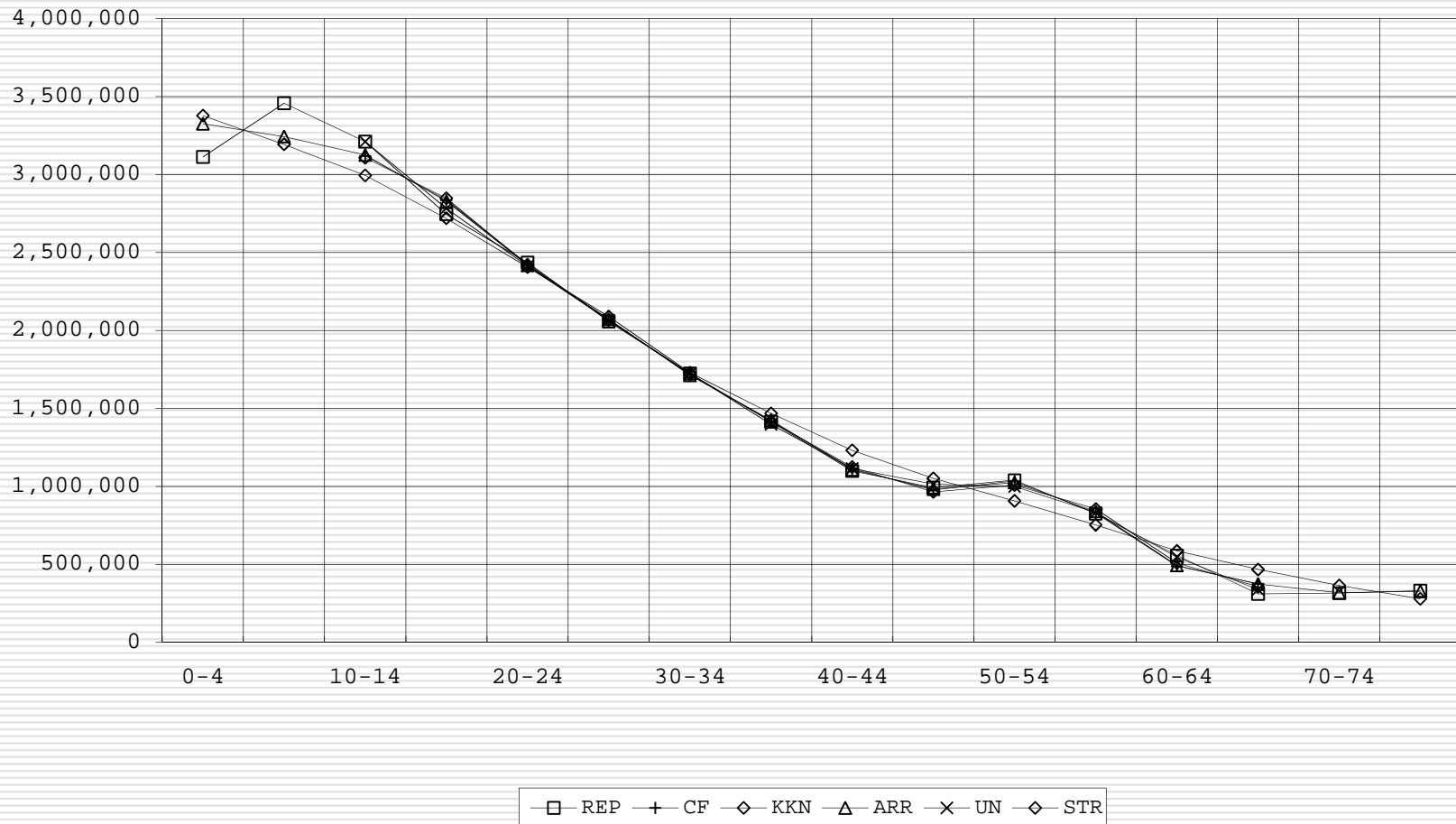
PAS = AGESMTH

- Demographic estimates such as the level of fertility and mortality can be adjusted for coverage and distribution errors of births and deaths



# TURKEY-1985

## 1. Male Population by Age

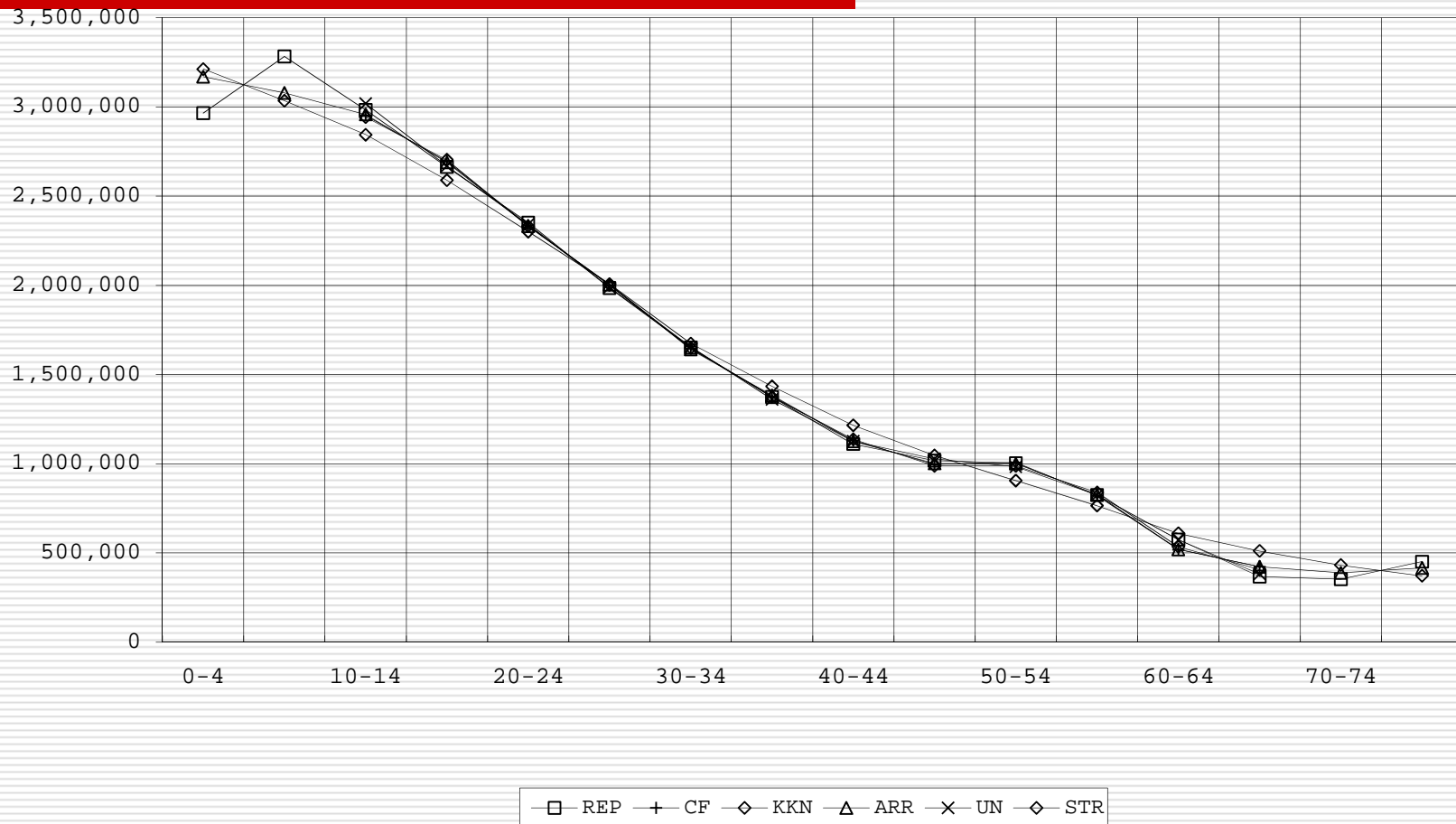




TURKEY-1985

United Nations Statistics Division

2. Female Population by Age



United Nations Workshop on Census Data Evaluation  
Hanoi, Viet Nam, 2 - 6 December 2013



# Adjusting census figures- some considerations

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- ❑ Consequences of making adjustment for population size might be substantial and sensitive
- ❑ Adjustments have an effect on geographic and demographic distributions of population
- ❑ Adjustment may be costly (*in doing and in explaining*)
- ❑ Adjustment may be complex and time consuming
- ❑ Adjustment requires careful communication