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* QUESTION 1:
summarize fincbtax
* Median of fincbtax
centile fincbtax, centile(50)
* Histogram of fincbtax:
histogram fincbtax
summarize fincbtax
display "Standard Error of the Mean (SE): " r(sd) / sqrt(r(N))
display "Margin of Error (95% CI): " 1.96 * (r(sd) / sqrt(r(N)))


* QUESTION 2:
generate log_fincbtax = ln(fincbtax) if fincbtax > 0
label variable log_fincbtax "Log of annual family income before tax"
summarize log_fincbtax
centile log_fincbtax, centile(50)
* Hhistogram of log_fincbtax:
histogram log_fincbtax
summarize log_fincbtax
display "Standard Error of the Mean (SE) for log_fincbtax: " r(sd) / sqrt(r(N))
display "Margin of Error (95% CI) for log_fincbtax: " 1.96 * (r(sd) / sqrt(r(N)))


* QUESTION 3:
generate log_100000 = ln(100000)
* The probability of log_fincbtax being greater than log(100000)
generate prob_gt_100000 = normal(r(mean) - log_100000)
* The actual fraction of the sample that has income greater than 100000
generate income_gt_100000 = fincbtax > 100000
summarize income_gt_100000
display "Fraction of sample with income > 100,000: " r(mean)
display "Probability of log_fincbtax > log(100,000) (Normal Approximation): " 1 - normal(r(mean) -
log_100000)


* QUESTION 4:
summarize vehq
display "Mean of vehq: " r(mean)
display "Variance of vehq (SD^2): " r(sd)^2
* Histogram of vehq:
histogram vehq, width(1) frequency
display "For Poisson: Mean and Variance should be approximately equal."


* QUESTION 5:
summarize vehq
scalar mean_vehq = r(mean)
scalar variance_vehq = r(sd)^2
scalar lambda = (mean_vehq + variance_vehq) / 2
display "Lambda (Poisson parameter): " lambda
* The Poisson probability for k <= 3
scalar poisson_prob = poisson(lambda, 3)
display "Poisson Probability (k <= 3): " poisson_prob
* The actual fraction of sample with vehq <= 3
generate vehq_leq3 = vehq <= 3
summarize vehq_leq3
scalar actual_fraction = r(mean)
display "Actual Fraction of Sample with vehq <= 3: " actual_fraction
display "Comparison:"
display "Poisson Probability (k <= 3): " poisson_prob
display "Actual Fraction of Sample (vehq <= 3): " actual_fraction
```