

Seroprevalence of HIV among childbearing women

Data from Hoff et al. NEJM 1988, 318: 525-30

[Stratified samples of mothers delivering in 6 different types of hospitals (A-F) in Massachusetts]

stratum:	A	B	C	D	E	F	SUM
N: number of births	5,385	18,256	16,776	11,292	27,028	1,015	79,752
W: Weight [$W = N / N$]	0.068	0.229	0.210	0.142	0.339	0.013	1.000
n: births sampled	3,741	11,864	5,006	3,596	6,501	0	30,708
x: # positive	30	31	11	1	8	0	81
p or $\hat{p} = x / n$: [estimated proportion +ve]	0.0080	0.0026	0.0022	0.0003	0.0012	-	
SE(\hat{p})*: [$\{ \hat{p} \cdot (1 - \hat{p}) / n \}$]	0.0015	0.0005	0.0007	0.0003	0.0004		

estimate of PROPORTION π Seropositive, along with its SE

W. \hat{p}	0.0005	0.0006	0.0005	0.0000	0.0004	?	0.0021
							$\pi\hat{p}$ (overall)

W squared . SE(\hat{p}) squared	1E-08	1E-08	2E-08	2E-09	2E-08		6.4E-08
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$$SE(W. \hat{p}) = \{ W^2 \cdot SE^2 \} = \mathbf{0.0003}$$

* assuming homogeneity within strata

** uncertainty (SE) of each \hat{p} determined by \hat{p} and n, not by N

95% CI: \hat{p} (lower) = $\hat{p} - 2 SE(\hat{p}) = \mathbf{0.0016}$
 \hat{p} (upper) = $\hat{p} + 2 SE(\hat{p}) = \mathbf{0.0026}$

Point and interval estimate of NUMBER (X) Seropositive

Xhat = N . \hat{p}	43.2	47.7	36.9	3.1	33.3		164.1
							Xhat (overall)

SE(N . \hat{p}) = N . SE(\hat{p})	7.9	8.6	11.1	3.1	11.8		
square of SE(N . \hat{p})	61.7	73.2	123.3	9.9	138.1		406.1

$$\{ SE(X)^2 \} = \mathbf{20.2}$$

$$95\% \text{ CI: } X \text{ (lower)} = Xhat - 2 SE(Xhat) = \mathbf{124.7}$$

$$95\% \text{ CI: } X \text{ (upper)} = Xhat + 2 SE(Xhat) = \mathbf{203.6}$$

Point and interval estimate of RATE (per 1000) Seropositive

$$\text{estimated rate per 1000} = 1000 \cdot \pi\hat{p} = \mathbf{2.1}$$

$$SE(\text{estimated rate}) = 1000 \cdot SE(\hat{p}) = \mathbf{0.3}$$

$$95\% \text{ CI: rate (upper)} = \text{est rate} + 2 SE(\text{est rate}) = \mathbf{1.6}$$

$$95\% \text{ CI: rate (lower)} = \text{est rate} - 2 SE(\text{est rate}) = \mathbf{2.6}$$