Erratum: "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States"[1]

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We are writing to correct computational errors in our article published in Volume 42(1) of *Demography* (February 2005) entitled "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States." Specifically, in this Erratum, we correct our calculations of the mortality decline share associated with clean water technologies reported in Tables 5 and 6 – and below, we include both corrected versions of Tables 5 and 6 together with corresponding corrections in the text.

Our specific mistake was to calculate mortality reduction shares by combining regression estimates using the natural log of mortality as the dependent variable (obtained by estimating Equation 1 shown on page 9) to overall percent reductions in mortality during the study period.[2] Instead, the estimates of interest should first be converted to percent reductions (and then compared to overall percent reductions in mortality), or they should alternatively be compared to the overall percent decline in log mortality. The former is the quantity of interest in our paper (the mortality decline share associated with clean water technologies), but we report all three (original, revised, and log form) in the last table at the bottom of this note.

Using estimates reported in Tables 5 and 6, percent reductions in mortality are computed as e^{β}-1 (where β is parameter estimates of interest), and the corresponding mortality decline shares explained are obtained by dividing these percent declines by the overall percent decline during the study period. Specific examples of revised calculations are as follows:

- Share of total mortality decline associated with clean water technologies:
$$\frac{(e^{-0.13}-1)}{0.30} = 0.406\ (41\%)$$
- Share of total infant mortality decline associated with clean water technologies:
$$\frac{(e^{-0.46}-1)}{0.62} = 0.59\ (59\%)$$
- Share of total child mortality decline associated with clean water technologies:
$$\frac{(e^{-0.50}-1)}{0.81} = 0.48\ (48\%)$$

Corrected versions of Tables 5 and 6 are provided below.

Additionally, corrections to the text are as follows:

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[1] We thank Claudia Goldin for identifying our errors and Kim Singer Babiarz for assistance in preparing this Erratum note.

[2] When coefficient estimates from equations with natural log transformed dependent variables are small, they approximate percent changes. However, this becomes less true with larger estimates.

- Abstract: We found that clean water was responsible for around forty percent the total mortality reduction in major cities, nearly two thirds of the infant mortality reduction, and nearly half of the child mortality reduction.

- Page 14: Clean water technologies account for about 41% of the total reduction in mortality during this period, 59% of the reduction in infant mortality, and 48% of the reduction in child mortality.

- Page 15: Declines in typhoid fever that were due to clean water technologies account for 1.7% of the total reduction in mortality, and all clean water related reductions in all waterborne diseases account for about 5% of the reduction in total mortality during this period. Reductions in pneumonia, meningitis, tuberculosis, and diphtheria/croup that were due to clean water technologies account for 8%, 4%, 5% and 3%, respectively, of the total mortality reduction. Together with typhoid fever and an assumption about unobserved reductions in diarrhea and enteritis, we can identify specific causes of death for 29 percentage points of the 41% decline in total mortality that is attributable to clean water.

Table 5. Effect of Clean Water Technologies on Mortality

	Dependent Variable (ln transformation)			
	Typhoid Mortality Rate	Total Mortality Rate	Infant Mortality Rate	Child Mortality Rate
Filter	−0.46*	−0.16**	−0.43**	−0.46**
	(0.23)	(0.04)	(0.09)	(0.11)
Chlorinate	−0.11	−0.02	−0.08	−0.07
	(0.16)	(0.03)	(0.08)	(0.10)
Chlorinate × Filter	0.32*	0.05*	0.06	0.03
	(0.14)	(0.02)	(0.07)	(0.09)
ln(Population)	−0.19	−0.86**	2.78**	1.69*
	(1.49)	(0.23)	(0.66)	(0.77)
Begin Chlorination Within	0.13	0.02	−0.05	0.00
Five Years	(0.10)	(0.01)	(0.06)	(0.07)
Begin Filtration Within	0.17	−0.09**	−0.18**	−0.14*
Five Years	(0.17)	(0.03)	(0.05)	(0.06)
ln(Mortality - 1)	0.02	0.01†	0.04†	−0.02
	(0.03)	(0.01)	(0.02)	(0.02)
ln(Mortality - 2)	0.05†	0.02**	−0.01	−0.02
	(0.03)	(0.01)	(0.02)	(0.02)
ln(Mortality - 3)	−0.17**	−0.01	−0.04*	−0.06**
	(0.03)	(0.00)	(0.02)	(0.02)
ln(Mortality - 4)	0.06	−0.01†	−0.08**	−0.04**
	(0.03)	0.00	(0.02)	(0.02)
ln(Mortality - 5)	0.02	−0.01†	−0.07**	−0.05**
	(0.03)	(0.01)	(0.02)	(0.02)
Joint Effect	−0.25†	−0.13**	−0.46**	−0.50**
(F Statistic)	(2.55)	(7.75)	(10.31)	(7.97)
Total Mortality Change, 1900-1936 (%)	-96	-30	-62	-81
Share of Total Due to Clean Water (%)	23[a]	41	59	48
N	411	415	415	415
R^2	0.94	0.96	0.83	0.88

Note: Huber-White corrected standard errors are in parentheses. All specifications include sewage treatment and chlorination dummy variables; year and city dummy variables; city trends; and demographic characteristics, including population share by gender, race, birthplace, and age.

[a]As shown in Table 8, clean water technologies explain almost lal the decline in mortality from typhoid fever when the effects are allowed to vary over time.

†$p < .10$; *$p < .05$; ** $p < .01$

Table 6. Other Cause-Specific Mortality Results

Dependent Variable (ln transformation)	Filter	Chlorinate	Filter × Chlorinate	*N*	R^2	Joint Share of Total Mortality Decline (%)[a]
Infectious Diseases						
Pneumonia	−0.25**	−0.19*	0.15*	415	0.90	8
	(0.08)	(0.08)	(0.06)			
Influenza	0.09	−0.15	−0.03	415	0.93	0
	(0.17)	(0.14)	(0.13)			
Malaria	−0.42	−0.35	0.64**	b309[b]	0.95	0
	(0.29)	(0.25)	(0.22)			
Small pox	2.57	−1.13	1.74	b95[b]	0.91	0
	(2.63)	(2.79)	(3.30)			
Measles	−0.63	−0.11	−0.10	396[b]	0.52	0
	(0.56)	(0.46)	(0.33)			
Scarlet fever	0.16	−0.24	−0.15	413	0.71	0
	(0.37)	(0.37)	(0.29)			
Whooping cough	−0.06	0.36	−0.42†	414	0.62	0
	(0.29)	(0.27)	(0.22)			
Diphtheria/croup	−0.64**	0.02	0.10	415	0.86	3
	(0.21)	(0.19)	(0.15)			
Meningitis	−0.72**	0.02	0.00	415	0.89	4
	(0.24)	(0.17)	(0.13)			
Tuberculosis	−0.09†	−0.08†	0.02	415	0.97	5
	(0.05)	(0.04)	(0.03)			
Chronic Diseases						
Cancer/Tumor	−0.03	−0.01	−0.02	415	0.98	0
	(0.04)	(0.04)	(0.03)			
Diabetes	−0.12	0.08	−0.06	415	0.90	0
	(0.09)	(0.08)	(0.07)			

Note: Huber-White corrected standard errors are in parentheses. All specifications include sewage treatment and chlorination dummy variables; year and city dummy variables; city trends; and demographic characteristics, including population share by gender, race, birthplace, and age.

[a]As determined by the jiont effect of filtration and chlorination and associated F statistics.

[b]Small samples are due to the exclusion of observations with values of zero; regressions using mortatlity and ln(mortality) as the dependent variable yield similar results.

†$p < .10$; *$p < .05$; ** $p < .01$

Description of Mortality Changes 1900 - 1936

	Units	1900	1936	Net change	Percent change	Log point change
Total Mortality	Deaths per 1,000	1935	1354	581	0.30	0.36
Infant Mortality	Deaths per 1,000	18931	7130	11801	0.62	0.98
Child Mortality	Deaths per 1,000	2818	522	2296	0.81	1.69
Cause Specific Mortality						
Typhoid Mortality	Deaths per 1,000	46.44	1.354	45.086	0.97	3.54
Pneumonia Mortality	Deaths per 1,000	185.76	125.922	59.838	0.32	0.39
Influenza Mortality	Deaths per 1,000	13.545	17.602	-4.057	-0.30	-0.26
Malaria Mortality	Deaths per 1,000	23.22	1.354	21.866	0.94	2.84
Small Pox Mortality	Deaths per 1,000	13.545	0	13.545	1.00	-
Measles Mortality	Deaths per 1,000	13.545	0	13.545	1.00	-
Scarlet Fever Mortality	Deaths per 1,000	9.675	1.354	8.321	0.86	1.97
Whooping Cough Mortality	Deaths per 1,000	11.61	2.708	8.902	0.77	1.46
Diptheria Mortality	Deaths per 1,000	44.505	1.354	43.151	0.97	3.49
Meningitis Mortality	Deaths per 1,000	46.44	4.062	42.378	0.91	2.44
Tuberculosis Mortality	Deaths per 1,000	214.785	71.762	143.023	0.67	1.10

Changes in Mortality Explained by Clean Water Technologies

	Regression results		Original calculations	Corrected calculations	
	(Log point change)	(Percent change)		Percent of mortality change explained by clean water	Percent of log mortality change explained by clean water technologies
Total Mortality	-0.13	-0.12	43%	41%	36%
Infant Mortality	-0.46	-0.37	74%	59%	47%
Child Mortality	-0.50	-0.39	61%	48%	30%