Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Underlying Causes of Death and Their Associated *ICD-10* Codes

Underlying cause of death	*ICD-10* codes
Critical congenital heart disease types	
Aortic interruption or atresia or hypoplasia	Q25.4, Q25.2
Coarctation or hypoplasia of the aortic arch	Q25.1
D-transposition of the great arteries	Q20.3
Double-outlet right ventricle	Q20.1
Ebstein anomaly	Q22.5
Hypoplastic left heart syndrome	Q23.4
Pulmonary atresia	Q22.0
Single ventricle	Q20.4
Teratology of Fallot	Q21.3
Total anomalous pulmonary venous connection	Q26.2
Tricuspid stenosis and atresia	Q22.4
Truncus arteriosus	Q20.0
Non-cardiac causes	
Sudden infant death syndrome	R95
Bacterial sepsis of newborn	P36
Maternal and placental complications	P01, P02
Short gestation and low birth weight	P07

ICD-10 – International Statistical Classification of Diseases and Related Health Problems, 10th revision

Non-cardiac causes are used for falsification analysis.

eTable 2. Poisson Regression Coefficients for the Association of Explanatory Variables With Deaths Due to Critical Congenital Heart Disease or Other/Unspecified Congenital Heart Disease

	(1)	(2)	(3)
		Poisson regression coefficient (95% confidence interval)	
Explanatory variable	**Mean of explanatory variable (95% confidence interval)**	**Critical congenital heart disease deaths**	**Other/unspecified congenital heart disease deaths**
Mandatory CCHD screening	0.021 (0.017, 0.026)	-0.406 (-0.699, -0.112)*	-0.241 (-0.410, -0.071)*
Non-mandatory CCHD screening	0.033 (0.027, 0.038)	-0.065 (-0.244, 0.114)	-0.016 (-0.233, 0.201)
Percentage of births from Black mothers	14.278 (13.862, 14.654)	0.020 (-0.038, 0.077)	-0.002 (-0.044, 0.040)
Percentage of plural term births	1.374 (1.361, 1.387)	0.036 (-0.154, 0.227)	-0.066 (-0.239, 0.108)
Log(real income in 2013 $)	10.668 (10.663, 10.673)	3.097 (-0.066, 6.261)	1.009 (-1.544, 3.562)
Log(unemployment rate)	1.892 (1.881, 1.903)	0.061 (-0.401, 0.524)	0.266 (-0.259, 0.791)

Note: Columns (2)-(3) report the estimated coefficients from a Poisson regression. Assuming β a positive (negative) estimated coefficient on a given explanatory variable indicates that the number of deaths was higher (lower) by exponential of β times when compared to the case where that explanatory variable was zero. In addition to the listed variables, state and month-year fixed effects are controlled for. Numbers in parenthesis are clustered confidence intervals at state-level to capture non-independence of observations in the same state. Deaths were defined as those that occurred between 24 hours and 6 months after birth. The number of state-month observations included in each model (i.e., for CCHD deaths and other cardiac deaths) is 3,978. International Statistical Classification of Diseases and Related Health Problems, 10th revision codes used to identify these underlying causes of death are listed in Supplement A1.

* $p<0.05$

CCHD – critical congenital heart disease

eTable 3. Critical Congenital Heart Disease and Other/Unspecified Congenital Cardiac Deaths by Year and State Screening Policy as of June 1, 2013

Year	Policy Status as of June 1, 2013	Births	CCHD Deaths		Other/unspecified Cardiac	
			Number	Rate per 100,000 Births	Number	Rate per 100,000 Births
2007	No Policy	2517910	283	11.2	375	14.9
2008	No Policy	2479148	266	10.7	352	14.2
2009	No Policy	2416420	244	10.1	344	14.2
2010	No Policy	2335964	192	8.2	333	14.3
2011	No Policy	2305436	213	9.2	333	14.4
2012	No Policy	2306397	220	9.5	322	14
2013	No Policy	1108342	117	10.6	162	14.6
2007	Mandatory not yet Implemented	436814	52	11.9	84	19.2
2008	Mandatory not yet Implemented	433728	59	13.6	76	17.5
2009	Mandatory not yet Implemented	424225	37	8.7	75	17.7
2010	Mandatory not yet Implemented	411695	51	12.4	52	12.6
2011	Mandatory not yet Implemented	407751	43	10.5	76	18.6
2012	Mandatory not yet Implemented	409134	52	12.7	55	13.4
2013	Mandatory not yet Implemented	198550	22	11.1	24	12.1
2007	Non-Mandatory	900784	106	11.8	127	14.1
2008	Non-Mandatory	882844	75	8.5	154	17.4
2009	Non-Mandatory	850646	76	8.9	98	11.5
2010	Non-Mandatory	825153	71	8.6	118	14.3
2011	Non-Mandatory	816032	89	10.9	110	13.5
2012	Non-Mandatory	815858	84	10.3	118	14.5
2013	Non-Mandatory	386962	37	9.6	54	14
2007	Mandatory	460725	37	8	54	11.7
2008	Mandatory	451974	41	9.1	63	13.9
2009	Mandatory	439374	33	7.5	52	11.8
2010	Mandatory	426574	33	7.7	50	11.7
2011	Mandatory	424371	35	8.2	55	13
2012	Mandatory	421452	26	6.2	34	8.1
2013	Mandatory	203058	13	6.4	21	10.3

Note: Deaths are those between 24 hours and 6 months after birth. Data in 2013 are total deaths by December 31, 2013 of infants born between Jan 1 and Jun 31, 2013. As shown in Figure 1, there are 30 states with no policy, 9 states with mandatory policy adopted but not yet implemented, 5 states with non-mandatory policy, and 8 states with mandatory policy. Note that Alabama had a non-mandatory policy but enacted a mandatory policy before June 2013, so it is included both in the second and the third categories.

CCHD – critical congenital heart disease

eTable 4. Unadjusted Absolute Declines in Deaths Due to Critical Congenital Heart Disease and Other/Unspecified Congenital Heart Disease Associated With State Mandatory Screening Policies, 2011-2013

Age range of deaths	Decline in deaths (95% confidence interval)			
	Critical congenital heart disease deaths		Other/unspecified congenital heart disease deaths	
	Reduction in death rate per 100,000 births	Number of avoided deaths post implementation	Reduction in death rate per 100,000 births	Number of avoided deaths post implementation
24 hours to <6 months	3.9 (3.6 – 4.1)	17.8 (16.5 – 18.8)	3.5 (3.2 – 3.8)	16.0 (14.6 – 17.4)
Sensitivity analyses of timing of mandate (age at death from 24 hours to < 6 months)				
Implemented Aug 1, 2011-June 30, 2012	1.9 (1.5 – 2.3)	8.7 (6.9 – 10.5)	2.8 (2.3 – 3.3)	12.8 (10.5 – 15.1)
Implemented July 1, 2012-June 1, 2013	4.6 (4.2 – 5.0)	21.1 (19.2 – 22.9)	5.8 (5.3 – 6.3)	26.5 (24.3 – 28.8)
Sensitivity analyses of timing of deaths (screening implemented Aug 1, 2011 to June 1, 2013)				
Birth to <6 months	3.5 (3.2 – 3.8)	16.0 (14.6 – 17.4)	5.0 (4.7 – 5.3)	22.9 (21.5 – 24.3)
Birth to <12 months	3.2 (3.0 – 3.4)	14.6 (13.7 – 15.6)	3.5 (3.2 – 3.8)	16.0 (14.6 – 17.4)
24 hours to <12 months	4.1 (3.9 – 4.4)	18.8 (17.8 – 20.1)	3.5 (3.2 – 3.8)	16.0 (14.6 – 17.4)
24 hours to <6 months, restricted to infants born at >32 weeks	3.5 (3.2 – 3.7)	16.0 (14.6 – 16.9)	2.6 (2.4 – 2.8)	11.9 (11.0 – 12.8)

Note: Declines in deaths are derived by comparing post vs pre policy implementation outcomes in states with mandatory policy. Numbers are reported in deaths per 100,000 births as well as absolute decline in deaths considering that 457,636 were born in states with mandatory policy after the policy took effect. Numbers in parenthesis are 95% confidence intervals.

eTable 5. Poisson Regression Coefficients on Time for States which Adopted Mandatory Critical Congenital Heart Disease Screening Policies for Dependent Variables of Deaths Due to Critical Congenital Heart Disease or Other/Unspecified Congenital Heart Disease, Excluding Months after Mandate Implementation

Explanatory variable	Poisson regression coefficient (95% confidence interval)	
	Critical congenital heart disease deaths	Other congenital cardiac deaths
Mandatory critical congenital heart disease screening x time	-0.001	-0.002
	(-0.008 – 0.006)	(-0.010 – 0.007)

Note: Each column reports the estimated coefficient of interaction between month-year variable and the group of eight states that implemented the mandatory screening policy at some point in the time period of the study from a single Poisson regression model. Note that the sample is restricted to the period in which the mandatory screening was not yet implemented in those eight states. The insignificant and very small estimated coefficient suggests that there was no different in the critical congenital heart disease or other/unspecified congenital cardiac deaths trends in states adopting the mandatory policy when compared with other states. This suggests that the difference-in-differences results are not biased. For more information see Dimick and Ryan (2014). In addition to the interaction of time in months and mandatory critical congenital heart disease screening policy, state and month-year fixed effects are controlled for as well as non-mandatory screening policies. Numbers in parenthesis are clustered confidence intervals at state-level to capture non-independence of observations in the same state. Deaths were defined as those that occurred between 24 hours and 6 months after birth. The number of state-month observations included in each model (i.e., for critical congenital heart disease deaths and other/unspecified congenital cardiac deaths) is 3,890. International Statistical Classification of Diseases and Related Health Problems, 10th revision codes used to identify these underlying causes of death are listed in Supplement A1.

* $p<0.05$

eTable 6. Numbers of Critical Congenital Heart Disease and Other/Unspecified Congenital Cardiac Deaths by Year and State Screening Policy as of June 1, 2013 for Sensitivity Analyses by Time Windows

Year	Policy Status as of June 1, 2013	Births	Number of Deaths								Death Rate per 100,000 Births							
			Birth to <6 months		Birth to <12 months		24 hr to <12 months		24 hr to <6 months infants born at >32 weeks		Birth to <6 months		Birth to <12 months		24 hr to <12 months		24 hr to <6 months infants born at >32 weeks	
			CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD	CCHD	Other CHD
2007	No Policy	2517910	312	424	334	490	305	441	258	331	12.4	16.8	13.3	19.5	12.1	17.5	10.2	13.1
2008	No Policy	2479148	293	398	328	465	301	419	248	314	11.8	16.1	13.2	18.8	12.1	16.9	10.0	12.7
2009	No Policy	2416420	276	393	305	472	273	423	224	302	11.4	16.3	12.6	19.5	11.3	17.5	9.3	12.5
2010	No Policy	2335964	218	389	252	474	226	418	175	296	9.3	16.7	10.8	20.3	9.7	17.9	7.5	12.7
2011	No Policy	2305436	234	388	269	459	248	404	193	310	10.1	16.8	11.7	19.9	10.8	17.5	8.4	13.4
2012	No Policy	2306397	240	371	277	432	257	383	198	282	10.4	16.1	12.0	18.7	11.1	16.6	8.6	12.2
2013	No Policy	1108342	134	188	147	215	130	189	106	142	12.1	17.0	13.3	19.4	11.7	17.1	9.6	12.8
2007	Mandatory not yet Implemented	436814	61	100	67	123	58	107	51	78	14.0	22.9	15.3	28.2	13.3	24.5	11.7	17.9
2008	Mandatory not yet Implemented	433728	66	88	75	112	68	100	55	72	15.2	20.3	17.3	25.8	15.7	23.1	12.7	16.6
2009	Mandatory not yet Implemented	424225	42	83	53	100	48	92	34	63	9.9	19.6	12.5	23.6	11.3	21.7	8.0	14.9
2010	Mandatory not yet Implemented	411695	54	61	69	74	66	65	44	48	13.1	14.8	16.8	18.0	16.0	15.8	10.7	11.7
2011	Mandatory not yet Implemented	407751	53	91	57	106	47	91	41	72	13.0	22.3	14.0	26.0	11.5	22.3	10.1	17.7
2012	Mandatory not yet Implemented	409134	55	72	60	91	57	74	48	49	13.4	17.6	14.7	22.2	13.9	18.1	11.7	12.0
2013	Mandatory not yet Implemented	198550	26	29	28	36	24	31	19	22	13.1	14.6	14.1	18.1	12.1	15.6	9.6	11.1
2007	Non-Mandatory	900784	119	148	136	180	123	159	99	116	13.2	16.4	15.1	20.0	13.7	17.7	11.0	12.9
2008	Non-Mandatory	882844	82	174	100	202	93	182	73	144	9.3	19.7	11.3	22.9	10.5	20.6	8.3	16.3
2009	Non-Mandatory	850646	86	116	99	136	89	118	73	92	10.1	13.6	11.6	16.0	10.5	13.9	8.6	10.8
2010	Non-Mandatory	825153	83	132	89	150	77	136	65	107	10.1	16.0	10.8	18.2	9.3	16.5	7.9	13.0
2011	Non-Mandatory	816032	94	127	111	149	106	132	80	97	11.5	15.6	13.6	18.3	13.0	16.2	9.8	11.9
2012	Non-Mandatory	815858	92	134	113	161	105	145	80	109	11.3	16.4	13.9	19.7	12.9	17.8	9.8	13.4
2013	Non-Mandatory	386962	41	58	45	67	41	63	31	51	10.6	15.0	11.6	17.3	10.6	16.3	8.0	13.2
2007	Mandatory	460725	40	64	45	76	42	66	32	48	8.7	13.9	9.8	16.5	9.1	14.3	6.9	10.4
2008	Mandatory	451974	47	78	53	90	47	75	41	59	10.4	17.3	11.7	19.9	10.4	16.6	9.1	13.1
2009	Mandatory	439374	34	65	37	80	36	67	29	42	7.7	14.8	8.4	18.2	8.2	15.2	6.6	9.6
2010	Mandatory	426574	34	60	41	72	40	62	33	42	8.0	14.1	9.6	16.9	9.4	14.5	7.7	9.8
2011	Mandatory	424371	41	68	46	78	40	65	31	50	9.7	16.0	10.8	18.4	9.4	15.3	7.3	11.8
2012	Mandatory	421452	27	43	32	58	31	49	25	30	6.4	10.2	7.6	13.8	7.4	11.6	5.9	7.1
2013	Mandatory	203058	18	25	22	27	17	23	13	19	8.9	12.3	10.8	13.3	8.4	11.3	6.4	9.4

CCHD – critical congenital heart disease; CHD=other/unspecified congenital cardiac disease

eTable 7. Poisson Regression Coefficients for Falsification Analysis for the Association Between Mandatory Screening for Critical Congenital Heart Disease and Deaths Due to Various Other Causes

Cause of death	(1) Coefficient (95% CI) for the effect of mandatory Critical Congenital Heart Disease screening	(2) Coefficient (95% CI) for the effect of non-mandatory Critical Congenital Heart Disease screening
Sudden infant death syndrome	0.139 (-0.088, 0.367)	0.090 (-0.059, 0.239)
Bacterial sepsis of newborn	0.158 (-0.192, 0.507)	0.082 (-0.070, 0.234)
Maternal and placental complications	0.216 (-0.370, 0.803)	0.359 (-0.050, 0.768)
Short gestation and low birth weight	-0.171 (-0.483, 0.142)	-0.056 (-0.207, 0.095)

Note: Each row reports the estimated coefficients of mandatory (column 1) and non-mandatory (column 2) screening policy from a single Poisson regression. Assuming β a positive (negative) estimated coefficient on a given explanatory variable indicates that the number of deaths was higher (lower) by exponential of β times when compared to the case where that explanatory variable was zero. All explanatory variables listed in Supplement eTable 2 are included in all models and state and month-year fixed effects are controlled for. Numbers in parenthesis are clustered confidence intervals at state-level to capture non-independence of observations in the same state. Deaths were defined as those that occurred between 24 hours and 6 months after birth. The number of state-month observations included in each model (i.e., for critical congenital heart disease deaths and other cardiac deaths) is 3,978. International Statistical Classification of Diseases and Related Health Problems, 10th revision codes used to identify these underlying causes of death are listed in Supplement A1.

CI – confidence interval