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Table S1. The data of MCH indicators in China from 1991 to 2023

Year	MMR (per 100,000 live births)	U5MR (per 1,000 per live births)	IMR (per 1,000 live births)	NMR (per 1,000 live births)
1991	80.00	61.00	50.20	33.10
1992	76.50	57.40	46.70	32.50
1993	67.30	53.10	43.60	31.20
1994	64.80	49.60	39.90	28.50
1995	61.90	44.50	36.40	27.30
1996	63.90	45.00	36.00	24.00
1997	63.60	42.30	33.10	24.20
1998	56.20	42.00	33.20	22.30
1999	58.70	41.40	33.30	22.20
2000	53.00	39.70	32.20	22.80
2001	50.20	35.90	30.00	21.40
2002	43.20	34.90	29.20	20.70
2003	51.30	29.90	25.50	18.00
2004	48.30	25.00	21.50	15.40
2005	47.70	22.50	19.00	13.20
2006	41.10	20.60	17.20	12.00
2007	36.60	18.10	15.30	10.70
2008	34.20	18.50	14.90	10.20
2009	31.90	17.20	13.80	9.00
2010	30.00	16.40	13.10	8.30
2011	26.10	15.60	12.10	7.80
2012	24.50	13.20	10.30	6.90
2013	23.20	12.00	9.50	6.30
2014	21.70	11.70	8.90	5.90
2015	20.10	10.70	8.10	5.40
2016	19.90	10.20	7.50	4.90
2017	19.60	9.05	6.77	4.48
2018	18.30	8.40	6.10	3.90
2019	17.80	7.80	5.60	3.50
2020	16.90	7.50	5.40	3.40
2021	16.10	7.10	5.00	3.10
2022	15.70	6.80	4.90	3.10
2023	15.10	6.20	4.50	2.80

Abbreviations: IMR – infant mortality rate, MMR – maternal mortality ratio, NMR – neonatal mortality rate, U5MR – under-five mortality rate.

Table S2. The data of health service coverage metrics

Year	Hospital delivery rate (%)	Maternal systematic management rate (%)	Postpartum visit rate (%)	Newborn visit rate (%)
1991	-	-	-	-
1992	-	-	-	-
1993	-	-	-	-
1994	-	-	-	-
1995	-	-	-	-
1996	60.70	-	-	-
1997	61.70	-	-	-
1998	66.20	-	-	-
1999	69.40	-	-	-
2000	72.90	77.20	86.20	85.80
2001	76.00	78.60	87.20	86.72
2002	78.80	78.20	86.70	86.12
2003	79.40	75.50	85.40	84.65
2004	82.80	76.40	85.90	84.96
2005	85.90	76.70	86.00	85.03
2006	88.40	76.50	85.70	84.70
2007	91.60	77.30	86.70	85.59
2008	94.50	78.10	87.00	85.36
2009	96.30	80.90	88.70	87.13
2010	97.80	84.10	90.80	89.60
2011	98.70	85.20	91.00	90.60
2012	99.20	87.60	92.60	91.80
2013	99.50	89.50	93.50	93.20
2014	99.60	90.00	93.90	93.60
2015	99.70	91.50	94.50	94.30
2016	99.80	91.50	94.60	94.60
2017	99.90	89.60	94.00	93.90
2018	99.90	89.90	93.80	93.70
2019	99.90	90.30	94.10	94.10
2020	99.90	92.70	95.50	95.50
2021	99.90	92.90	96.00	96.20
2022	99.90	93.60	96.50	96.70
2023	99.90	94.50	97.00	97.40

Table S3. Definition of variables

Variable name			Definition	Unit
Neonatal (NMR)	Mortality	Rate	The number of deaths occurring before 28 days per 1,000 live births in a given year.	1,000 per live births
Infant Mortality Rate (IMR)			The number of deaths occurring before 1 year of age per 1,000 live births in a given year.	1,000 per live births
Under-five (U5MR)	Mortality	Rate	The number of deaths occurring before 5 years of age per 1,000 live births in a given year.	1,000 per live births
Maternal (MMR)	Mortality	Rate	The number of maternal deaths per 100,000 live births in a given year.	100,000 per live births
Hospital Delivery Rate			It refers to the ratio of live births to all live births in institutions that have obtained midwifery technical qualifications within a year.	Percentage (%)
Maternal Management Rate	Systematic		It refers to the ratio of the number of maternal system management personnel to the number of live births within a year.	percentage (%)
Postpartum Visit Rate			It refers to the ratio of the number of mothers who have received one or more postpartum visits within a year to the number of live births.	percentage (%)
Newborn Visit Rate			It refers to the ratio of the number of newborns who receive one or more visits within one week after discharge within a year to the number of live births.	percentage (%)

Table S4 Non-significant short-term adjustment parameter (α) from VECM estimation

	Estimate	Std. Error	t-Statistic	Prob. (> t)
MMR				
ECT1	1.191762	0.697933	1.708	0.10491
ECT3	0.589662	0.626952	0.941	0.35940
U5MR.dl1	0.553346	0.834159	0.663	0.51551
IMR.dl1	-0.301710	0.994826	-0.303	0.76515
NMR.dl1	-0.003027	0.565540	-0.005	0.99579
Maternal systematic management rate	-0.471321	0.442326	-1.066	0.30071
Postpartum visit rate	0.450121	0.445762	1.010	0.32598
Newborn visit rate	-0.032676	0.035781	-0.913	0.37319
RME project	0.199076	0.215533	0.924	0.36789
U5MR				
ECT1	0.561148	0.366157	1.533	0.142778
ECT3	0.257360	0.328918	0.782	0.444126
MMR.dl1	0.222428	0.113684	1.957	0.066096
IMR.dl1	0.931258	0.521916	1.784	0.091240
NMR.dl1	0.604786	0.296699	2.038	0.056479
Hospital delivery rate	0.006388	0.015931	0.401	0.693165
Postpartum visit rate	-0.467017	0.233860	-1.997	0.061174
Newborn visit rate	0.039285	0.018772	2.093	0.050803
RME project	-0.198138	0.113075	-1.752	0.096745
NRCMS	0.006171	0.081287	0.076	0.940320
IMR				
ECT1	-0.056224	0.299623	-0.188	0.8532
MMR.dl1	0.041346	0.093026	0.444	0.6620
U5MR.dl1	-0.485025	0.358105	-1.354	0.1924
IMR.dl1	0.237077	0.427080	0.555	0.5857
NMR.dl1	0.209244	0.242787	0.862	0.4001
Hospital delivery rate	-0.004401	0.013036	-0.338	0.7396
Maternal systematic management rate	0.296552	0.189891	1.562	0.1358
Postpartum visit rate	-0.298302	0.191366	-1.559	0.1365
NRCMS	-0.100054	0.066517	-1.504	0.1499
NMR				
ECT2	0.237178	0.272203	0.871	0.39505
ECT3	0.584499	0.337537	1.732	0.10044
MMR.dl1	0.028112	0.116663	0.241	0.81230
U5MR.dl1	0.213595	0.449093	0.476	0.64007
IMR.dl1	0.687463	0.535593	1.284	0.21558
Maternal systematic management rate	0.127284	0.238139	0.534	0.59954
Postpartum visit rate	-0.139570	0.239989	-0.582	0.56807
Newborn visit rate	0.003813	0.019264	0.198	0.84531
RME project	-0.201210	0.116038	-1.734	0.10001

Abbreviations: IMR – infant mortality rate, MMR – maternal mortality ratio, NMR – neonatal mortality rate, NRCMS – Project and the New Rural Cooperative Medical Scheme; RME – Reducing Maternal Mortality and Eliminating Neonatal Tetanus; U5MR – under-five mortality rate.

Table S5 Clinically interpretable statistical terms in maternal and child health research

Statistical term	Clinical interpretation	Healthcare system example
Vector Error Correction Model (VECM)	Captures the dynamic interplay between maternal and child mortality indicators (e.g., MMR, IMR, U5MR, NMR) and policy interventions.	Used to assess how the implementation of the Rural Maternal and Child Health (RME) project affected mortality rates over time.
Error Correction Term (ECT)	Reflects the responsiveness of mortality indicators to policy shocks or system imbalances.	ECT2 in the model showed that maternal mortality rate (MMR) adjusted by -1.344 units per period, indicating a 134% overshooting correction.
Overshooting Adjustment in ECT	Suggests that certain interventions or system responses may be too aggressive, leading to short-term instability or unintended consequences.	In the case of MMR, the model identified a 134% overshooting adjustment through ECT2 ($\alpha = -1.344$, $P = 0.016$), indicating that the maternal health system overcorrected after a deviation.
Granger Causality Test	Identifies leading indicators in maternal and child health systems.	Neonatal mortality rate (NMR) was found to Granger-cause infant mortality rate (IMR), under-five mortality rate (U5MR), and maternal mortality rate (MMR), suggesting that NMR changes may signal future shifts in other mortality indicators.
Cointegration	Suggests that maternal and child health indicators are influenced by shared systemic factors (e.g., policy, resource allocation).	The presence of three cointegration relationships among MMR, IMR, U5MR, and NMR implies that these indicators are jointly influenced by national MCH policies.
Augmented Dickey-Fuller (ADF) Test	Determines whether mortality indicators need to be differenced before modeling to avoid spurious regression.	The ADF test confirmed that MMR, IMR, U5MR, and NMR required first-order differencing to achieve stationarity.
Joinpoint Regression	Helps identify the impact of policy interventions on mortality trends.	The sharp decline in NMR between 2002–2005 (APC = -14.5%) coincided with the national rollout of the RME project.
Annual Percent Change (APC)	Quantifies the effectiveness of interventions on mortality trends.	The APC for NMR from 2002–2005 was -14.5%, indicating a rapid decline during the early phase of the RME project.
Average Annual Percent Change (AAPC)	Useful for comparing long-term trends across regions or indicators.	From 1991–2023, the AAPC for NMR was -7.40%, reflecting a consistent long-term decline in neonatal mortality.

Table S6. Cointegration coefficient vector (β) results of VECM estimation

	ECT1	ECT2	ECT3
MMR.I2	-0.65	-0.74	-0.89
U5MR.I2	0.00	0.00	1.00
IMR.I2	0.00	1.00	0.00
NMR.I2	1.00	0.00	0.00
constant	-0.79	-0.58	-0.63

Abbreviations: IMR – infant mortality rate, MMR – maternal mortality ratio, NMR – neonatal mortality rate, U5MR – under-five mortality rate.

Table S7. Results of Granger causality test

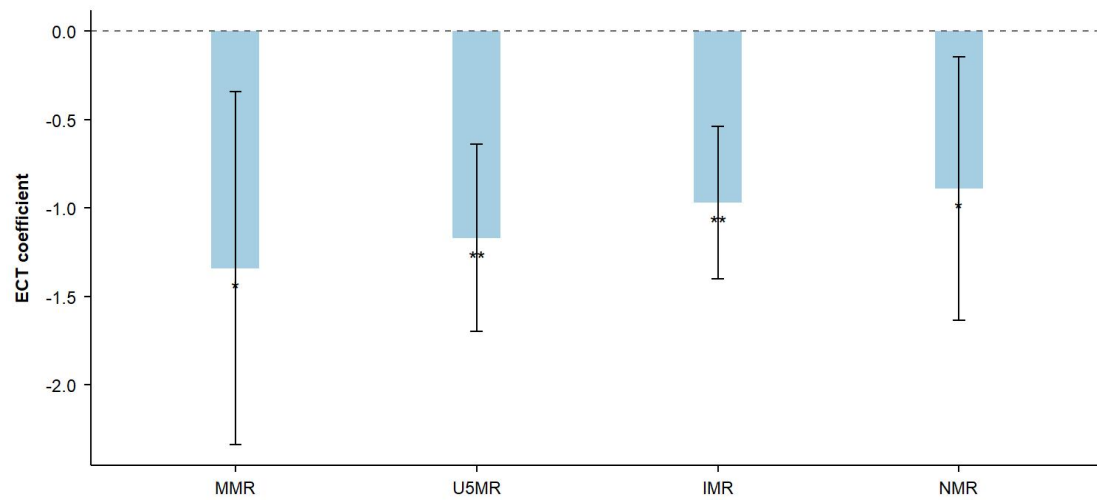
Cause	Effect	Statistic	<i>P</i> value
MMR	U5MR	1.62	0.16
	IMR	1.62	0.16
	NMR	1.62	0.16
U5MR	MMR	2.12	0.06
	IMR	2.12	0.06
	NMR	2.12	0.06
IMR	MMR	1.89	0.10
	U5MR	1.89	0.10
	NMR	1.89	0.10
NMR	MMR	2.36	0.04
	U5MR	2.36	0.04
	IMR	2.36	0.04

Abbreviations: IMR – infant mortality rate, MMR – maternal mortality ratio, NMR – neonatal mortality rate, U5MR – under-five mortality rate.

Table S8. Diagnostic test of the VECM model

	χ^2	df	<i>P</i> value
Portmanteau test	169.17	164	0.37
Jarque-Bera test	4.60	8	0.80
Skewness test	3.07	4	0.55
Kurtosis test	1.53	4	0.82

Figure S1. Short-term adjustment speeds of maternal and child mortality indicators



Note: Negative α -values indicate error correction direction, with larger absolute magnitudes implying faster adjustment speeds. The error bar denotes 95% confidence interval (CI). * $P < 0.05$, ** $P < 0.001$. MMR: maternal mortality ratio; U5MR: under-five mortality rate; IMR: infant mortality rate; NMR: neonatal mortality rate.