

**Appendix Table 1: Timing and content of selected policies to reduce unnecessary caesarean sections in China**

Year	Content of policy	Area	Reference
<b>National level</b>			
2009	Strict control of caesarean section indications and reduce the medical risk associated with caesarean sections	Rural China	Ministry of Health. Guidelines on further increasing hospital deliveries in rural China [in Chinese]. <a href="http://www.moh.gov.cn/mohbgt/s9507/200902/38943.shtml">http://www.moh.gov.cn/mohbgt/s9507/200902/38943.shtml</a> . Accessed Dec 15, 2017.
2010	(1) Strict control of caesarean section indications and reduce the caesarean section rate for non-clinical indications (2) Caesarean section rates need to decrease year by year over the next three years (3) Performance appraisal results are communicated regularly to the local government and the community	China	Ministry of Health. Implementation plan for the performance appraisal of maternal and child health activities at county level [in Chinese]. <a href="https://wenku.baidu.com/view/4e2761d73186bceb19e8bbe1.html">https://wenku.baidu.com/view/4e2761d73186bceb19e8bbe1.html</a> . Accessed Dec 15, 2017.
2010	(1) Establish at least 10 training centres for the promotion of vaginal delivery, the improvement of maternal and infant health and the promotion of appropriate techniques for midwifery and prenatal health education	China	China Maternal and Child Health Association. Programme to promote vaginal delivery and improve maternal and infant health [in Chinese]. <a href="http://zhongyi.sina.com/news/jkx/20106/44321.shtml">http://zhongyi.sina.com/news/jkx/20106/44321.shtml</a> . Accessed Dec 15, 2017.

	<p>(2) Train at least 2000 teachers on appropriate techniques for midwifery and prenatal health education</p> <p>(3) Improve the standards of 100 hospitals so that they qualify as demonstration hospitals</p> <p>(4) Establish the formal title of “midwife” and promote the education of midwives</p>		
2011	Encouraging vaginal delivery and performing caesarean section with medical indications and reduce unnecessary interventions. This includes setting standards of clinical practice.	China	<p>Ministry of Health. Notice on the issuance of “administrative management on maternal health care services” and “standards of clinical practice on maternal health care services” [in Chinese].</p> <p><a href="http://www.moh.gov.cn/zwgkzt/glgf/201306/61f0bee3af344623a566ab099ffbf34.shtml">http://www.moh.gov.cn/zwgkzt/glgf/201306/61f0bee3af344623a566ab099ffbf34.shtml</a>. Accessed Dec 15, 2017.</p>
2012	Strengthen access to and quality of midwifery skills; standardizing maternal health care services; promotion of spontaneous labour and reduction of caesarean section rates	China	<p>Ministry of Health. Implementation plan of The Chinese Women and Children Development Outline in 2011-2020 [in Chinese].</p> <p><a href="http://www.nhfpc.gov.cn/fys/s7900/201202/cffc29c192d4e529c6290c280507df9.shtml">www.nhfpc.gov.cn/fys/s7900/201202/cffc29c192d4e529c6290c280507df9.shtml</a>. Accessed Dec 15,</p>

			2017.
2014	Advocate spontaneous labour and promote early breastfeeding; strictly control caesarean section rates; prohibit the prenatal diagnosis of the sex of the foetus and sex-selective abortion without medical indication	China	National Health and Family Planning Commission of China. Guidance on maternal and child health services in the context of the relaxation of the one-child policy [in Chinese]. <a href="http://www.nhfpc.gov.cn/fys/s3581/201406/fb7b841983a2460e92b350bef532a6a1.shtml">http://www.nhfpc.gov.cn/fys/s3581/201406/fb7b841983a2460e92b350bef532a6a1.shtml</a> . Accessed Dec 15, 2017.
2014	The number of caesarean sections without medical indication are used as an indicator to assess the performance of hospitals, including whether they qualify as a baby-friendly hospital, and caesareans performed for non-medical indications need to be reported to the hospital director for review	China	National Health and Family Planning Commission of China. Notice on carrying out the review of the baby friendly hospital [in Chinese]. <a href="http://www.moh.gov.cn/fys/s3585/201406/556c0b7673e8470f9641c28d119a9f31.shtml">http://www.moh.gov.cn/fys/s3585/201406/556c0b7673e8470f9641c28d119a9f31.shtml</a> . Accessed Dec 15, 2017.
2014	(1) Update national standards for medical indications of caesarean sections (2) Give doctors the right to refuse a caesarean section on request when they deem it not to be medically indicated. If women persist in	China	Obstetrics Group of Obstetrics and Gynecological Medical Association, Chinese Medical Association. The expert consensus on cesarean delivery operation (2014). Chin J

	their request for a caesarean section the case is referred to the head of the obstetric department for review		Obstet Gynecol 2014; 49: 721-724. (in Chinese).
2014	Revise clinical guidelines, including the management of dystocia. A prolonged latent phase of labour, previously an indication for caesarean section, was removed from the list of indications, and a new definition of arrest of labour, shifting the onset of labour from 3 cm dilatation to 6 cm, was introduced	China	Obstetrics Subgroup, Chinese Society of Obstetrics and Gynecology, Chinese Medical Association. The expert consensus on cesarean delivery operation (2014). Chin J Obstet Gynecol 2014; 49: 486. (in Chinese).
<b>Provincial level</b>			
2010	(1) Advocate spontaneous labour and set caesarean section targets to reduce caesarean sections (2) Meet with relevant stakeholders to discuss measures to reduce caesarean section rates	Sichuan Province	Health Department of Sichuan Province. Key points of working on maternal and child health in Sichuan Province in 2010 [in Chinese]. <a href="http://www.sc.gov.cn/zwgk/gggs/ws/1/201001/t20100127_899549.shtml">http://www.sc.gov.cn/zwgk/gggs/ws/1/201001/t20100127_899549.shtml</a> . Accessed Dec 15, 2017.
2015	Strict control of caesarean section indications; establish formal classification system for caesarean sections; ensure that unnecessary caesarean sections are declining; enhance supervision and strengthen management of labour; set caesarean section targets for the reduction of caesarean section rates in the	Anhui Province	Health and Family Planning Commission of Anhui Province. Notice on strengthening the management of caesarean section delivery [in Chinese]. <a href="http://www.ahwjw.gov.cn/fyjk/tzgg/201507/b377a0a8658f4a82bf8f6def">http://www.ahwjw.gov.cn/fyjk/tzgg/201507/b377a0a8658f4a82bf8f6def</a>

	province over the next 3 to 5 years		<a href="#">6c373940.html</a> . Accessed Dec 15, 2017.
<b>Municipal or county level</b>			
2012	Reform the payment system for vaginal and caesarean delivery in order to reduce caesarean section rates (e.g. the cost of birth for women having a natural birth in rural levels 1 and 2 hospitals are fully reimbursed by Government)	Qidong, Jiangsu Province; Huangpo districts in Wuhan, Hubei Province	Ministry of Health. Pilot project on controlling caesarean section rates in rural women through a reform of the payment system. Medical reform newsletter [in Chinese]. <a href="http://www.moh.gov.cn/fzs/s9665/201208/a9b05ca174ab408f9d952c6fba70483.shtml">http://www.moh.gov.cn/fzs/s9665/201208/a9b05ca174ab408f9d952c6fba70483.shtml</a> . Accessed Dec 15, 2017.
2012	The Wuhan Health Ministry issued an assessment notice to regulate the upper limits of caesarean section rates: 60% in Level 3 hospitals; 50% in level 2 and private hospitals; and 40% in level 1 hospitals. If the hospital exceeds the upper limit the hospital will be notified. If no action is taken the hospital may lose its license to provide midwifery services	Wuhan, Hubei Province	Bureau of Health of Wuhan, Hubei Province. The hospitals with higher caesarean section rates in Wuhan will be closed down and reformed. Medical reform newsletter [in Chinese]. <a href="http://www.moh.gov.cn/mohzcfgs/s9665/201212/666956785ed1411f8e63fb7dc42ebbf5.shtml">http://www.moh.gov.cn/mohzcfgs/s9665/201212/666956785ed1411f8e63fb7dc42ebbf5.shtml</a> . Accessed Dec 15, 2017.

**Appendix Table 2: Factors associated with caesarean section rates in 438 hospitals in China (2012-2016)**

		Number of births (%)	Weighted caesarean section rate *(%)	Model 1	Model 2	Model 3
				Weighted for sampling distribution of population and adjustment for clustering of births within hospitals	Model 1 and adjustment for year, region, hospital level, number of obstetricians, day of week, antenatal care, education and marital status	Model 2 and adjustment for age, Robson classification, maternal complications and birth weight
				RR (95% CI)	RR (95% CI)	RR (95% CI)
<b>Institutional characteristics</b>						
Region	East-urban	1246446(18.2)	47.1	1.14(1.02 to 1.28)	1.00(0.90 to 1.12)	0.95(0.86 to 1.04)
	East-rural	742751(10.9)	41.2	1.00	1.00	1.00
	Central-urban	1377415(20.1)	52.6	1.27(1.13 to 1.43)	1.11(0.99 to 1.26)	1.04(0.94 to 1.16)
	Central-rural	1341317(19.6)	45.3	1.10(0.98 to 1.24)	1.12(1.00 to 1.25)	1.11(1.01 to 1.22)
	West-urban	1294650(18.9)	45.6	1.11(0.98 to 1.25)	1.01(0.90 to 1.13)	0.97(0.88 to 1.06)
	West-rural	836003(12.2)	31.3	0.76(0.67 to 0.87)	0.78(0.70 to 0.89)	0.87(0.78 to 0.96)
Hospital level	level 1	465283(6.8)	38.9	0.94(0.83 to 1.06)	0.94(0.84 to 1.05)	0.99(0.90 to 1.08)
	level 2	3228388(47.2)	41.4	1.00	1.00	1.00
	level 3	2801744(41.0)	49.5	1.20(1.12 to 1.27)	1.10(1.02 to 1.18)	1.04(0.98 to 1.10)
	unknown	343167(5.0)	38.9	0.94(0.75 to 1.17)	0.93(0.78 to 1.12)	0.96(0.84 to 1.11)
Numbers of obstetricians per 1000 births of admitted hospital	<4	1950744(28.5)	38.5	1.00	1.00	1.00
	4-5	2349510(34.4)	43.7	1.13(1.04 to 1.23)	1.07(0.99 to 1.15)	1.07(1.00 to 1.13)
	6-7	1444360(21.1)	47.7	1.24(1.14 to 1.35)	1.17(1.08 to 1.26)	1.15(1.08 to 1.23)
	8-9	452982(6.6)	48.5	1.26(1.11 to 1.43)	1.20(1.08 to 1.34)	1.19(1.09 to 1.30)
	10-14	361111(5.3)	48.4	1.26(1.13 to 1.40)	1.19(1.08 to 1.31)	1.18(1.10 to 1.28)
	>=15	274964(4.0)	48.0	1.25(0.96 to 1.62)	1.13(0.94 to 1.35)	1.17(1.01 to 1.35)
	missing	4911(0.1)	53.3	1.38(1.27 to 1.50)	1.10(0.99 to 1.23)	1.11(1.02 to 1.20)
Day of the week	Monday	1014491(14.8)	45.0	1.00(0.99 to 1.00)	1.00(1.00 to 1.01)	1.00(1.00 to 1.00)
	Tuesday	1034067(15.1)	45.3	1.01(1.00 to 1.01)	1.01(1.00 to 1.01)	1.00(1.00 to 1.01)
	Wednesday	1021508(14.9)	45.1	1.00	1.00	1.00
	Thursday	1011659(14.8)	44.9	1.00(0.99 to 1.00)	1.00(0.99 to 1.00)	1.00(1.00 to 1.00)
	Friday	1025712(15.0)	45.6	1.01(1.01 to 1.02)	1.01(1.01 to 1.02)	1.01(1.01 to 1.02)
	Saturday	886742(13.0)	39.9	0.89(0.87 to 0.90)	0.90(0.88 to 0.91)	0.93(0.92 to 0.95)
	Sunday	844403(12.3)	37.6	0.83(0.82 to 0.85)	0.85(0.83 to 0.86)	0.89(0.88 to 0.91)

Women's characteristics						
Antenatal care	none	108149(1.6)	38.2	0.82(0.76 to 0.89)	0.86(0.78 to 0.95)	0.91(0.84 to 0.99)
	1-3	532794(7.8)	35.8	0.77(0.71 to 0.83)	0.82(0.77 to 0.86)	0.87(0.84 to 0.90)
	4-6	2188246(32.0)	41.8	0.90(0.86 to 0.95)	0.93(0.89 to 0.97)	0.96(0.93 to 1.00)
	7-9	1980901(29.0)	46.4	1.00	1.00	1.00
	>=10	1845369(27.0)	45.7	0.98(0.94 to 1.03)	0.97(0.94 to 1.00)	0.98(0.96 to 1.00)
	missing	183123(2.7)	47.8	1.03(0.95 to 1.12)	0.99(0.91 to 1.09)	0.99(0.92 to 1.06)
Education	none	37447(0.5)	35.2	0.75(0.66 to 0.86)	0.88(0.79 to 0.97)	0.90(0.83 to 0.97)
	primary school	231470(3.4)	37.2	0.79(0.74 to 0.85)	0.93(0.88 to 0.98)	0.94(0.90 to 0.97)
	middle school	2351710(34.4)	39.6	0.85(0.81 to 0.88)	0.92(0.89 to 0.95)	0.95(0.92 to 0.98)
	high school	1828112(26.7)	46.8	1.00	1.00	1.00
	college or higher	2241015(32.8)	47.7	1.02(0.98 to 1.06)	0.96(0.94 to 0.99)	0.96(0.94 to 0.98)
	missing	148828(2.2)	41.5	0.89(0.72 to 1.09)	0.82(0.68 to 1.00)	0.82(0.69 to 0.97)
Marital status	single, widowed or divorced	101490(1.5)	28.8	0.66(0.60 to 0.72)	0.73(0.68 to 0.78)	0.86(0.81 to 0.90)
	married	6735630(98.5)	43.8	1.00	1.00	1.00
	missing	1462(0.0)	50.1	1.15(1.06 to 1.24)	1.03(0.95 to 1.11)	1.05(0.98 to 1.12)
Age	<20	204044(3.0)	27.5	0.64(0.61 to 0.68)		0.73(0.71 to 0.76)
	20-24	1507658(22.0)	36.3	0.85(0.83 to 0.87)		0.88(0.87 to 0.89)
	25-29	2843633(41.6)	42.8	1.00		1.00
	30-34	1435687(21.0)	51.3	1.20(1.18 to 1.22)		1.15(1.14 to 1.16)
	35-39	501512(7.3)	57.9	1.35(1.32 to 1.38)		1.31(1.30 to 1.32)
	>=40	111470(1.6)	60.7	1.42(1.38 to 1.45)		1.49(1.47 to 1.51)
	missing	234578(3.4)	39.4	0.92(0.83 to 1.02)		0.99(0.94 to 1.05)
Maternal complications**	Direct obstetric complications	485698(7.1)	83.1	2.07(2.00 to 2.14)		1.74(1.70 to 1.78)
	Medical diseases	429738(6.3)	51.2	1.28(1.23 to 1.32)		1.13(1.11 to 1.15)
	None above	5923146(86.6)	40.1	1.00		1.00
Robson classification	Nulliparous, single, cephalic, >=37 weeks	3644993(53.3)	41.1	2.11(2.02 to 2.20)		2.22(2.14 to 2.30)
	Multiparous, single, cephalic, >=37 weeks, without a uterine scar	1604124(23.5)	19.5	1.00		1.00
	Uterine scar, single, cephalic, >=37 weeks	809216(11.8)	91.2	4.69(4.44 to 4.95)		4.42(4.21 to 4.64)
	Nulliparous, single, breech	134795(2.0)	88.7	4.55(4.30 to 4.82)		2.82(2.70 to 2.95)
	Multiparous, single, breech	73741(1.1)	80.6	4.14(3.92 to 4.36)		2.38(2.29 to 2.48)
	All multiple pregnancies	119585(1.7)	82.4	4.23(4.01 to 4.46)		3.75(3.60 to 3.91)

	All single, other abnormal lies	17705(0.3)	84.3	4.33(4.03 to 4.65)		2.61(2.46 to 2.75)
	All single, cephalic, <=36 weeks	398475(5.8)	41.8	2.15(2.03 to 2.27)		2.13(2.05 to 2.22)
	Can't be classified	35948(0.5)	32.2	1.65(1.41 to 1.93)		1.76(1.54 to 2.02)
Birth weight of fetus	<2500g	395712(5.8)	47.1	1.12(1.08 to 1.17)		0.90(0.88 to 0.92)
	2500-3999g	5970128(87.3)	41.9	1.00		1.00
	>=4000g	456039(6.7)	61.8	1.47(1.44 to 1.51)		1.43(1.40 to 1.45)
	missing	16703(0.2)	36.5	0.87(0.77 to 0.98)		0.79(0.73 to 0.87)
All		6838582(100.0)	43.5	-		-

\*Weighted for sampling distribution of the population; \*\* Direct obstetric complications: ruptured uterus, placenta praevia, abruptio placentae, unspecified antepartum haemorrhage, pre-eclampsia, eclampsia, HELLP syndrome or any foetal malpresentation (breech, shoulder or other); Medical diseases: heart disease, embolism/thrombophlebitis, hepatic disease, severe anaemia (Haemoglobin < 70 g/L), renal disease (including urinary tract infection), lung disease (including upper respiratory tract infection), HIV/AIDS, connective tissue disorders, gestational diabetes mellitus and cancer.



**Appendix Table 3: Time trends in caesarean section rates by age of the woman (438 hospitals in China in 2012-2016)**

	2012	2013	2014	2015	2016	p-value (interaction)
<b>Weighted caesarean section rate (%) [number of caesarean sections, % of caesarean sections]</b>						
<20	30.0[12664,2.1%]	29.8[13068,2.2%]	27.6[12050,1.9%]	25.7[10570,2.0%]	23.8[8493,1.4%]	-
20-24	38.9[138876,23.4%]	39.1[129921,22.0%]	36.5[118902,18.7%]	33.7[89945,16.6%]	31.5[79427,12.8%]	
25-29	46.3[244510,41.2%]	46.0[239653,40.6%]	43.2[273150,42.9%]	40.8[221102,40.9%]	38.7[260083,42.0%]	
30-34	53.2[136889,23.1%]	53.7[141467,24.0%]	51.8[159495,25.0%]	50.1[142075,26.3%]	48.8[176607,28.5%]	
>=35	58.7[59933,10.1%]	60.0[65818,11.2%]	59.0[73844,11.6%]	57.8[77390,14.3%]	57.0[94177,15.2%]	
<b>Crude RR (95% confidence intervals) – Model 1</b>						
<20	1.00	1.00(0.96 to 1.03)	0.92(0.88 to 0.96)	0.86(0.81 to 0.90)	0.79(0.75 to 0.84)	0.0000
20-24	1.00	1.00(0.98 to 1.02)	0.94(0.91 to 0.96)	0.87(0.84 to 0.89)	0.81(0.78 to 0.84)	
25-29	1.00	0.99(0.98 to 1.01)	0.93(0.92 to 0.95)	0.88(0.86 to 0.90)	0.84(0.82 to 0.86)	
30-34	1.00	1.01(1.00 to 1.02)	0.97(0.96 to 0.99)	0.94(0.92 to 0.96)	0.92(0.9 to 0.94)	
>=35	1.00	1.02(1.01 to 1.03)	1.01(0.99 to 1.02)	0.98(0.97 to 1.00)	0.97(0.95 to 0.99)	
<b>Adjusted RR (95% confidence intervals) – Model 3*</b>						
<20	1.00	1.00(0.97 to 1.04)	0.93(0.89 to 0.97)	0.87(0.82 to 0.91)	0.80(0.76 to 0.85)	0.0000
20-24	1.00	1.00(0.99 to 1.02)	0.93(0.91 to 0.95)	0.87(0.84 to 0.89)	0.80(0.78 to 0.83)	
25-29	1.00	0.99(0.98 to 1.00)	0.91(0.90 to 0.93)	0.86(0.84 to 0.88)	0.80(0.78 to 0.82)	
30-34	1.00	0.99(0.98 to 1.00)	0.93(0.92 to 0.95)	0.89(0.88 to 0.90)	0.85(0.84 to 0.86)	
>=35	1.00	1.00(0.98 to 1.01)	0.95(0.94 to 0.96)	0.91(0.89 to 0.92)	0.87(0.86 to 0.88)	

234578 (3.4%) births had no information on age of the woman; \* Model 3 without adjustment for age

**Appendix Table 4: Policies potentially influencing caesarean section rates in 398 hospitals in China (2016)**

	<b>Level 1 (n=27)</b>	<b>Level 2 (n=211)</b>	<b>Level 3 (n=136)</b>	<b>unknown (n=24)</b>	<b>All (n=398)</b>
<b>Cost</b>					
Median cost of caesarean section (range)	4000(2170-6000)	5000(1650-13500)	7000(700-15000)	3900(2200-10000)	5000(700-15000)
Median costs of vaginal delivery (range)	2000(500-4000)	2500(700-5500)	3500(300-7588)	2000(1000-4000)	2500(300-7588)
<b>Policies</b>					
Number (%) of hospitals with a policy to reduce caesarean sections	27(100.0)	193(91.5)	128(94.1)	21(87.5)	369(92.7)
Number (%) of hospitals with a target for caesarean sections	21(77.8)	143(67.8)	85(62.5)	18(75.0)	267(67.1)
Median caesarean section rate target for hospitals with a target (range)	35(20-50)	40(15-60)	45(30-70)	35(20-60)	40(15-70)
Number (%) of hospitals with a list of clinical indications for caesarean section	25(92.6)	197(93.4)	129(94.9)	19(79.2)	370(93.0)
Number (%) of hospitals with a payment adjustment for caesarean sections	5(18.5)	34(16.1)	24(17.7)	8(33.3)	71(17.8)
Number (%) of hospitals with health education for women on caesarean sections	26(96.3)	198(93.8)	132(97.1)	22(91.7)	378(95.0)
Number (%) of hospitals with a in service training for caesarean sections	24(88.9)	179(84.8)	123(90.4)	20(83.3)	346(86.9)

40 hospitals had no data on caesarean section policy