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	2). Proportion ( , aggregate rate				2). Proportion es (22-23 wks)		tal intervent	ions,
Regions (n)	Birth at level III Units	Antenatal steroids	Cesarean delivery	Regions (n)	Surfactant within 2hrs	Neonatol- ogist present at birth	Intubatio n after birth	Transfer to NICU
A (29)	96.6/100	69.0	0	A (29)	69.0	89.7	89.7	82.8
B (33)	84.8	81.8	36.4	B (33)	69.7	93.9/100	93.9	78.8
C (67)	83.6	71.6	29.9	C (67)	64.2	83.6	83.6	71.6
D (24)	87.5	87.5	37.5/100	D (24)	83.3	91.7	91.7	95.8
E (46)	84.8	95.7/100	23.9	E (46)	87.0/100	91.3	97.8/100	100/100
F (23)	91.3	82.6	8.7	F (23)	82.6	91.3	91.3	91.3

Region (n)	Birth at level III units				proport the regio	egional p ion to the n with hij idle time	percenta ghest figu	ige in res in	Means of the normalized proportions		
A (5)	100	40.0	) (	6	103.5	41.8	1	0	Contraction of the state of the state		ean tal and
B (5)	40.0	60.0	) (	1 1	41.4	62.7	6. L	0	48	220120	etric
C (20)	20.0	10.0	) 5.	0	20.7	10.4		13.3	35	sco	ores
D (4)	75.0	100			77.6	104.		0	15	0.000	inatal
	1					-			61	Activity Scores	
E (10)	80.0	100	0	0	82.8	104.	5	0	62	A	40
F (5)	20.0	20.0	40	.0	20.7	20.9	1	06.7	49		1.22
1 (2004-2007										В	42
roportion ne		ention, N=49			C. Standard				Means of	C	18
Region (n)	Sur- factant within	Neonatol- ogist present	Intubation after birth	Transfer to	propor	regional tion to the	ie percer	ntage in	the	D	61
S 2.8	2hrs	at birth	arter birth	NICU		gion with niddle tir			proportions	E	62
		80.0	0	40.0	-				31	3	
A (5)		0010		40.0	0	85.2	0	40.0	48	F	32
A (5)	0	60.0	40.0		45.9	63.9	40.9	40.0	21	0	
B (5)	40.0	60.0	40.0	10015							
		60.0 35.0	40.0 10.0	25.0	11.5	37.3	10.2	25.0	60		
B (5)	40.0	-53535	185.00	10015		37.3 79.9	10.2 51.1	25.0 50.0	60		
B (5) C (20)	40.0 10.0	35.0	10.0	25.0	11.5				60 61		

#### T1,2004-2007

Regions (n)	Birth at le III units		enatal roids	Cesarean delivery	proportion t region w	ith highes	entage in figures i	n the	Means of the normalized proportions	м	ean
A (21)	81.0	8	5.7	0	midd	e time pe	riod T2		proportions	2277	natal
B (15)	80.0	7	3.3	40.0	83.9	89.6	0		58	1000	nd tetric
C (28)	82.1	71	8.6	7.1	82.8	76.6	106	.7	89		ores
D (8)	62.5	8	7.5	25.0	84.9	82.1	18.	9	62	25.002	rinata
E (21)	81.0	_	5.2	28.6	64.7	91.4	66.	7	74	10424	tivity ores
		-			83.9	99.5	76.	3	87	30	nes
F (8)	62.5	8	7.5	12.5	64.7	91.4	33.	3	63	A	67
	7), 23 weeks onatal interve	ntion, N=10	i.							В	85
Region (n)	Surfactant within 2hrs	Neonatol- ogist Present	Intubatio direct after birt	to	propor	ch regional tion to the with highe	percenta	ge in the	Means of the normalized proportions	C D	66
	, Sano:	at birth	21.4533	2200000		a summer of		1 22/201			78
A (21)	52.4	85.7	71.4	81.0	60.2	91.3	73.0	81.0	76	E	92
B (15)	60.0	93.3	60.0	93.3	68.9	99.4	61.3	93.3	81	F	53
C (28)	53.6	75.0	57.1	67.9	61.6	79.9	58.4	67.9	67	1	53
D (8)	75.0	75.0	75.0	87.5	86.2	79.9	76.7	87.5	83		
E (21)	90.5	81	95.2	100	104.0	86.3	97.3	100.0	97		
F (8)	25.0	75.0	25.0	37.5	28.7	79.9	25.6	37.5	43		

## Figure 1. Calculation of the regional activity scores based on the regional rates of 3 key obstetric and 4 key neonatal interventions in T1, T2 and T3. See methods section (continued).

## T2, 2014-2016

	4-16) 22 we ion obstetr		ion, N=7	4										
Region (n)	Birth level units	ll ste	enatal eroids	Cesarean delivery		proporti	regional p on to the p ith highest	figures i	ge in the		Means of the normalized proportions			
A (12)	100	4	1.7	0			time per	100 12					<b>—</b>	
B (10)	80.0	6	0.0	20.0		103.5	43.6	5	0		49	]		ean natal
C (19)	78.9	3	6.8	0		82.8	62.7	7	53.3		66	]	a	ind
D (10)	100	1	100	20.0		81.7	38.5	5	0		40			tetric
E (19)	94.7		100	0	- 7	103.5	104.	-	53.3	- V	87			ores rinatal
F (4)	75.0		0	0	-	98.0	104.	5	0		68			tivity
			0	0		77.6	0		0		26		Sc	ores
T2 , 22 week Proportion n		ervention, 2	014-16,	N=74									Α	51
Region	Sur- factant	Neonatol -ogist	Intuba ion dir		er	percentag	e in the regi	ion with hi	ortion to the		Means of the normalized		В	66
(n)	within	Present	afte	r NICU			in middle ti	me period	T2	_	proportions		c	44
	2hrs	at birth	birth	1		67.0	88.7	51.1	66.7		68	1	D	93
A (12)	58.3	83.3	50.0	66.7		57.5	106.5	51.1	50		65	1	E	
B (10)	50.0	100	50.0	50.0		30.2	84.0	43.0	31.6		47	-	E	85
C (19)	26.3	78.9	42.1	31.6	- 7	92.0	106.5	104.5	90			-	F	53
D (10)	80.0	100	100	90.0				104.5		-	98	-		
E (19)	89.5	94.7	100	100		102.9	100.9			-	102	-		
F (4)	50.0	75.0	100	75.0		57.5	79.9	104.5	75.0		79	]		

Region (n)	Birth at level III units	Anter sterc		sarean livery	to the	ional percer percentage i igures in mir	n the regio	n with	Means of the normalized proportions			
A (17)	94.1	81	.0	0				-			M	ean
B (23)	87.0	80	.0	43.5	97.4	84.	-	0	61			natal
C (48)	85.4	82	.1	41.7	90.1	83.	6	116.0	97			nd tetric
D (14)	78.6	62	5	50.0	88.4	85.	8	111.2	95			ores
E (27)	77.8	81		40.7	81.4	65.	3	133.3	93		= Per	
					80.5	84.	6	108.5	91	- 11		ivity
F (19)	94.7	62	.5	10.5	98.0	65.	3	28.0	64	-11	Sco	ores
2 (2014-2016 roportion ne	5), 23 weeks onatal interv	ention, N=1	148								А	7
Regions (n)	Surfactant within 2hrs	Neonat- ologist Present	Intubation direct after birth	Transf to NICL	the perc	ional percen entage in the res in middl	e region wi	th highest	Means of the normalized		B C	94 93
		at birth							proportions	71		-
A (17)	76.5	94.1	82.4	94.1	87.9	100.2	84.3	94.1	92	- 11	D	9
B (23)	78.3	93.9	78.3	91.3	90.0	100.0	80.1	91.3	90		E	9
C ( 48)	79.2	85.4	81.3	87.5	91.0	90.9	83.1	87.5	88			3
D (14)	85.7	85.7	100	100	98.5	91.3	102.2	100.0	98		F	8
E (27)	85.2	88.9	96.3	100	97.9	94.7	98.5	100.0	98			L
F (19)	89.5	94.7	94.7	94.7	102.8	100.9	96.8	94.7	99			

T3, 2017-2019

F (10)

80.0

60.0

50.0

100

Regions (n)	Birth at level III units	Antenata steroids			the pe	rcentage i	rcentage in n the regio iddle time	on with hig	ghest	Means of the normalized proportions			
A (14)	100	42.9	0					_					
B(11)	72.7	72.7	9.1		103	.5	44.8	0		49	1		ean,
C (14)	57.1	50.0	7.1		75.	2	76.0	24	.3	59	1		onatal and
D (16)	75	93.8	37.5		59.		52.2	19	- 7	44			tetric
E (16)	100	100	6.3		77.		98.0	10	<u> </u>	92			ores
F ( 9)	55.6	55.6	0		103		104.5	16		75			rinatal ores
3 (2017-2019) leonatal interv	ventions, N= 8		Intubation	Transfer								B	58 60
Regions (n)	Surfactant	Neonat-	Intubation	Transfer		6.0	h regional		and in	Means of	٦	В	60
	within	ologist	direct	to			tion to the			the		с	56
	2hrs	Present at birth	after birth	NICU		region v	with highe: time pe	st figures i eriod T2	in middle	normalized proportions		D	91
A (14)	50.0	100	50	50.0		57.5	106.5	50.3	50.0	66		E	81
	54.5	72.7	54.5	45.4		62.6	77.4	55.7	45.4	60	-	F	59
B(11)		64.3	71.4	64.3		65.6	67.1	73.0	64.3	68	1		
B ( 11) C (14)	50				_	0010					-		
	50 68.8	87.5	87.5	100.0		79.1	93.2	89.5	100.0	90			
C (14)		87.5	87.5 81.3	100.0	- '	79.1 79.1	93.2 79.9	89.5 83.1	100.0	90	-		

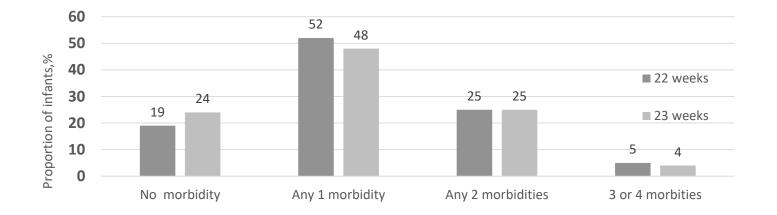
Region (n)	Birth at level III Units	Antenatal Steroids	Cesarean delivery			percer	nal percentage in these in midd	e region	with high			Means of the normalized proportions			
A (25)	96.0	96.0	12.0			99.4	10	00.3	32.0	<u> </u>		77			ean natal
B (21)	66.7	85.7	47.6			69.0	8	9.6	126	_		95			natai
C (30)	93.3	100	13.3			96.6		04.5	35.5	-					etric
D (7)	83.3	83.3	33.3			86.2		7.0	88.8			79	1	sco	res
E (22)	91.9	86.4	18.2			95.1	9	0.3	48.	5		87			natal
F (10)	80.0	70.0	10.0			82.8	7	3.1	26.7	,		78			ivity ores
	19), 23 weeks leonatal inter Surfactant	ventions, N=	115	Tran	rtor	]			percenta			Means of the		A B	85 90
	< 2hrs	gist @ birth	@birth	NI			the regi	ion with	he percer highest fi ne period	gures in		normalized proportions	5	с	82
A (25)	88.0	84.0	76.0	10	00			-	· ·			92		D	92
B (21)	66.7	81.0	75.7	95	.2		101.1	89.5	77.1	100.0		84		Ľ	32
C (30)	60.0	93.3	83.3	86	.7		76.7	86.3 99.4	77.4	95.2		85		E	82
D (7)	66.7	100	100	10	00	1 🔫	69.0 76.7	99.4 106.5	85.2	86.7 100.0	7	96		F	69
E (22)	59.1	68.2	95.5	10		1	67.9	72.6	97.6	100.0		85			
									57.0	100.0					

92.0 63.9 51.1 100.0

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The perinatal activity scores comprised the mean obstetric and neonatal activity scores and were determined as follows. First, we calculated the aggregated rates of neonatal and obstetric interventions at 22 and 23 weeks in the middle time period (T2, 2014-2016) and the healthcare regions with the highest rate for each indicator were given a score of 100 (A). Then we created a perinatal activity score for each region by expressing them as a percentage of the highest scores. Each infant was then assigned a specific normalized perinatal activity score based on their GA and the region they were born in as shown in **B,C,D,E,F,G** 

e Figure 2



Major Neonatal Morbidities (MNM) in all one-year survivors born alive at 22 and 23 weeks in three time periods 2004-2007, 2014-16 and 2017-19. MNM were defined as Intraventricular hemorrhage grade 3-4, cystic periventricular leukomalacia; Surgical necrotizing enterocolitis; retinopathy of prematurity stage  $\geq$ 3; severe bronchopulmonary dysplasia [with  $\geq$ 30% oxygen at 36 w+ 0 d postmenstrual age)

# eTable 1. Definitions

Live birth	Defined according to the World Health Organization (39)
Stillbirth	Defined according to the World Health Organization (39)
Small for gestational age (SGA)	Infants with birth weight SD scores < - 2 SDs were calculated according to the national intrauterine growth standard, based on ultrasonically estimated fetal weights (14)
Preeclampsia	Blood pressure, 140/90 mm Hg after 20 weeks of pregnancy and proteinuria $\geq 0.3$ g/24 hours or $\geq 0.3$ g/L
Preterm prelabor rupture of membranes	Spontaneous rupture of the membranes 1 hour before the onset of contractions
Chorioamnionitis	Diagnosis as set clinically by the obstetrician
Antenatal corticosteroid treatment	Any: at least one 12-mg dose of betamethasone; complete course: 2 doses of betamethasone with 24-hour interval
Intraventricular hemorrhage (IVH)	Defined according to Papile et al (15)
Cystic periventricular leukomalacia	Defined according to de Vries et al (16)
Retinopathy of prematurity (ROP)	Defined according to the International Committee for the Classification of Retinopathy of Prematurity (18)
Bronchopulmonary dysplasia (BPD)	Need for supplemental oxygen at 36 weeks of GA
Severe BPD	Need for ≥ 30% oxygen at 36 weeks of GA
Major neonatal morbidity (MNM)	At least 1 of IVH of grade 3 or higher, cPVL, ROP of stage 3 or higher, severe BPD or surgical NEC.
Congenital anomalies	Classified according to the WHO International Classification of Diseases, 10th revision (dislocation of the hip joints Q65.0-Q65.5] Preauricular tags [Q17.0], undescended testes [Q53.0–Q53.9], and patent ductus arteriosus [Q25.0] were not classified as anomalies.

eTable 2. Characteris	stics of pregnancies	and of infants born alive i	n health care regions v	with GA-specific perina	ital activity scores above	e and below the
national average						
	T1	Т 2	Т 3	T 1	T 2	Т 3

		1 •2007ª	T 2014-	2 ·2016		3 -2019	T 2004-	1 -2007ª	T 2014-	2 ·2016		3 -2019
		/eeks	22 W			/eeks		leeks	23 W			/eeks
Total number, live births	N=	: 49	N=			=80	N=	101	N=1			115
Number of infants in above and below average perinatal activity scoring regions <sup>b</sup>	Above average n=13	Below average n = 36	Above average n= 39	Below average n= 35	Above average n= 32	Below average n=48	Above average n = 36	Below average n=65	Above average n=131	Below average n=17	Above average n=53	Below average n=62
Mother												
Pregnancy complications												
Placental abruption/vaginal bleeding	0/13 (0)	5/36 (9)	11/39 (28)	5/35 (14)	7/32 (22)	12/48 (25)	6/36 (17)	3/62 (5)	29/131 (22)	1/17 (6)	11/53 (21)	19/62 (31)
Chorioamnionitis	1/13 (8)	9/36 (25)	6/39 (15)	5/35 (14)	5/32 (16)	5/48 (10)	3/36 (8)	8/65 (12)	22/131 (17)	1/17 (6)	4/53 (8)	8/62 (13)
Preeclampsia	0/13	2/36 (6)	0	0	2/32 (6)	0	2/36 (6)	2/63 (3)	6/125 (5)	0/17 (0)	2/53 (4)	4/362 (7)
PPROM	43/13 (23)	6/36 (17)	11/39 (28)	4/35 (11)	5/32 (16)	7/48 (15)	11/36 (31)	9//65 (14)	26/131 (20)	5/17 (29)	12/53 (23)	10/62 (16)
Multiple birth	3/13 (23)	7 /36 (19)	9/39 (23)	11/35 (31)	7/32 (22)	9/48 (19)	3/36 (8)	5/65 (8)	29/131 (22)	4/17 (24)	10/53 (19)	13/62 (21)
Infant	. ,		. ,			. ,	. ,	. ,	· · · ·			
Gestational age, wks, median	22.7	22.6	22.6	22.6	22.6	22.4	23.4	23.6	23.4	23.4	23.4	23.4
Male sex	9/13 (69)	17/36 (47)	20/39 (51)	19/35 (54)	16/32 (50)	25/48 (52)	21/36 (58)	34/65 (52)	76/131 (58)	6/17 (35)	26/53 (49)	33/62 (53)
Birth weight, median (min-max), g	498 (361-710)	509 (280-730)	488 (380-618)	490 (345-670)	483 (322-605)	500 (370-648)	571 (436-690)	598 (320-808)	596 (300-1615)	535 (500-955)	572 (400-680)	558 (366-777)
SGA	2/13 (15)	2/36 (6)	5/39 (13)	3/35 (9)	3/32 (9)	3/48 (6)	3/36 (8)	4/64 (6)	16/131 (12)	0/17 (0)	1/51 (2)	9/62† (6)
One -year mortality All live-births	8/13 (62)	36/36† (100)	20/29 (51)	25/35 (71)	15/32 (47)	34/48† (71)	12/36 (33)	36/65† (55)	49/131 (37)	8/17 (47)	16/53 (30)	22/62 (36)

		<sup>-</sup> 1 -2007ª Veeks	T <u>2014</u> 22 W	-2016	2017	' 3 - <u>2019</u> /eeks		<sup>-</sup> 1 -2007ª Veeks	T : 2014-: 23 We	2016	2017	3 - <u>2019</u> /eeks
Total number, live births	N=	= 49	N=	:74	N=	=80	N=	101	N=1	48	N=	115
Died in first 12 hrs of age	6/13 (46)	31/36†† (86)	9/39 (23)	18/35† (51)	4/32 (13)	19/48† (40)	2/36 (6)	25/65†† (39)	12/119 (9)	3/17 (12)	2/53 (4)	7/62 (11)
Alive at 1-year (live- born)	5/13 (39)††	0/36 0	19/39 (49)	10/35 (29)	17/32 (53)†	14/48 (29)	24/36 (67)†	29/65 (45)	82/131 (63)	9/17 (53)	37/53 (70)	40/62 (65)
Alive at 1 year without major neonatal morbidities	1/5 (20)	0	4/19 (21)	1/10 (10)	3/17 (18)	4/14 (29)	7/24 (29)	1/29 † (3)	22/82 (27)	1/9 (11)	12/37 (32)	7/40 (18)

eTable2.Characteristics of pregnancies and of infants born alive in health care regions with GA-specific perinatal activity scores above and below the national average (continued)

Abbreviations, GA, gestational age; SGA, small for gestational age (birth weight< -2SD)<sup>15</sup>; PPROM, preterm prelabor rupture of membranes, Data are presented as n (%) unless otherwise indicated.

<sup>a</sup> Data are from Fellman et al.<sup>11</sup>

<sup>b</sup>Among live-born at 22 weeks, the regions with perinatal activity scores above national average had a mean score of 81 (range 61-93) and regions with scores below the national average had a mean score of 45 (range 18-60). Among live-born infants at 23 weeks, regions with scores above the national average had a mean score of 91 (range 84-96) and those with below national average had a mean score of 73 (range 53-82).

P value determined using chi-square or Fisher's exact test (if the cell size was <5) for differences between the above and below - average perinatal activity scoring regions in T1, T2 and T3.

†P≤.05; ††P<.005