

Figure A1- Study timeline with data sources used (pentagons) and timing of Maternal Newborn Dashboard implementation (oval)

Table A2- The six clinical performance indicators included in the Maternal Newborn Dashboard in Ontario

Clinical performance indicators	Target %	Definitions
Indicator 1- Percentage of newborn screening samples that are unsatisfactory for testing	<2.0	Number of newborn screening samples with unsatisfactory reason(s), expressed as a percentage of the total number of newborn screening samples submitted from a given hospital/midwifery practice. NOTE: Samples coded as unsatisfactory only due to collection at less than 24 hours of age (i.e., there are no other reasons the sample has been deemed unsatisfactory) will not be considered as unsatisfactory for this analysis, since sample collection at less than 24 hours of age is recommended in cases of early discharge, transfer or transfusion.
Indicator 2- Percentage use of episiotomy in spontaneous vaginal births	<13.0	Number of women having a spontaneous vaginal birth who have an episiotomy, expressed as a percentage of the total number of women having a spontaneous vaginal birth (in a given place and time)
Indicator 3- Percentage of formula supplementation in term infants whose mothers intended to breastfeed	<20.0	Number of term live babies receiving formula supplementation, expressed as a percentage of the total number of term babies whose mothers intended to breastfeed (in a given place and time)
Indicator 4- Percentage of repeat cesarean section in low risk women not in labour at term with no medical or obstetrical complications done prior to 39 weeks gestation	<11.0	Number of women with a cesarean delivery performed from ≥ 37 to < 39 weeks gestation, expressed as a percentage of the total number of low-risk women having a repeat cesarean delivery at term (in a given place and time). NOTE: Repeat cesarean delivery in low risk women is defined as a cesarean delivery performed prior to the onset of labour, among women with a singleton live birth, with a history of one or more previous cesarean deliveries and with no fetal or maternal health conditions or obstetrical complications. Women with an indication for a cesarean delivery are excluded, other than the following indications: fetal malposition / malpresentation, previous cesarean delivery, accommodates care provider/organization, maternal request.
Indicator 5- Percentage of women delivering at term who had GBS screening at 35-37 weeks gestation	>94.0	Number of women who had GBS screening at 35-37 weeks gestation, expressed as a percentage of the total number of women delivering at term (given place and time)
Indicator 6- Percentage of women induced with an indication of post-dates who are less than 41 weeks gestation at delivery	<5.0	Number of women who were less than 41 weeks of gestation at delivery, expressed as a percentage of the total number of women who had labour induction and an indication for induction of 'post-dates pregnancy' (given place and time)

Table A3- Average denominator sizes for the six clinical performance indicators, November 2009 to March 2015

Clinical performance indicator	Denominator size, by month or quarter		
	Mean (SD)	Minimum and maximum	Mean Square Error
Indicator 1- Unsatisfactory newborn screening samples*	32 182 (3 296)	19 432 to 36 109	0.66281
Indicator 2- Episiotomy	6 602 (387)	5 700 to 7 439	0.23519
Indicator 3- Formula supplementation	7 542 (626)	5 954 to 8 990	0.85501
Indicator 4- Elective repeat cesarean delivery prior to 39 weeks	586 (63)	362 to 754	4.37372
Indicator 5- GBS screening	9 379 (565)	8 128 to 10 608	0.59527
Indicator 6- Post-dates induction prior to 41 weeks	909 (88)	753 to 1 104	2.44891

* Quarterly

Sensitivity Analyses-

A) Removal of data from one hospital site with delayed data upload and acknowledgement

Table A4- Results from segmented regression analysis for six clinical performance indicators and two internal validation outcomes from Ontario birth registry datasets, when data from one hospital site with delayed data upload were excluded

	Parameter estimate and 95% CI (%)	p-value
Primary Analyses		
Indicator 1- Unsatisfactory newborn screening samples*		
Intercept (baseline rate)	2.25 (1.27 to 3.24)	<0.001
Pre-intervention slope (per quarter)	0.00 (-0.13 to 0.14)	0.96
Change in level after intervention	-0.81 (-2.72 to 1.10)	0.42
Change in slope (per quarter) after intervention	0.11 (-0.17 to 0.39)	0.45
Post-intervention slope (pre-intervention slope plus change in slope)	0.11 (-0.39 to 0.62)	0.67
Indicator 2- Episiotomy		
Intercept (baseline rate)	12.24 (11.93 to 12.56)	<0.001
Pre-intervention slope (per month)	-0.03 (-0.05 to -0.02)	<0.001
Change in level after intervention	-1.10 (-1.74 to -0.46)	0.001
Change in slope (per month) after intervention	0.00 (-0.03 to 0.04)	0.96
Post-intervention slope (pre-intervention slope plus change in slope)	-0.03 (-0.06 to -0.00)	0.04
Indicator 3- Formula supplementation		
Intercept (baseline rate)	33.47 (33.12 to 33.82)	<0.001
Pre-intervention slope (per month)	-0.07 (-0.09 to -0.06)	<0.001
Change in level after intervention	2.03 (1.28 to 2.78)	<0.001
Change in slope (per month) after intervention	-0.07 (-0.11 to -0.02)	0.005
Post-intervention slope (pre-intervention slope plus change in slope)	-0.14 (-0.18 to -0.10)	<0.001
Indicator 4- Elective repeat cesarean delivery prior to 39 weeks		
Intercept (baseline rate)	58.32 (57.91 to 58.73)	<0.001
Pre-intervention slope (per month)	-0.22 - (-0.24 to -0.20)	<0.001
Change in level after intervention	-5.41 (6.30 to -4.52)	<0.001
Change in slope (per month) after intervention	-0.15 (-0.20 to -0.11)	<0.001
Post-intervention slope (pre-intervention slope plus change in slope)	-0.36 (-0.41 to -0.32)	<0.001
Indicator 5- GBS screening		
Intercept (baseline rate)	92.98 (92.75 to 93.22)	<0.001
Pre-intervention slope (per month)	0.01 (0.00 to 0.02)	0.04
Change in level after intervention	-0.64 (-1.13 to -0.14)	0.01
Change in slope (per month) after intervention	0.12 (0.10 to 0.15)	<0.001

	Parameter estimate and 95% CI (%)	p-value
Post-intervention slope (pre-intervention slope plus change in slope)	0.14 (0.11 to 0.16)	<0.001
Indicator 6- Post-dates induction prior to 41 weeks		
Intercept (baseline rate)	22.16 (20.59 to 23.73)	<0.001
Pre-intervention slope (per month)	0.09 (0.02 to 0.17)	0.02
Change in level after intervention	1.10 (-2.75 to 4.95)	0.54
Change in slope (per month) after intervention	-0.47 (-0.65 to -0.30)	<0.001
Post-intervention slope (pre-intervention slope plus change in slope)	-0.38 (-0.56 to -0.20)	<0.001
Control Analyses		
Internal control outcome #1: Cesarean in induced nulliparous women		
Intercept (baseline rate)	30.00 (29.28 to 30.72)	<0.001
Pre-intervention slope (per month)	0.05 (0.01 to 0.08)	0.01
Change in level after intervention	-0.04 (-1.44 to 1.36)	0.96
Change in slope (per month) after intervention	-0.03 (-0.11 to 0.05)	0.44
Post-intervention slope (pre-intervention slope plus change in slope)	0.02 (-0.05 to 0.08)	0.62
Internal control outcome #2: Use of auscultation		
Intercept (baseline rate)	31.84 (28.21 to 35.47)	<0.001
Pre-intervention slope (per month)	0.38 (0.19 to 0.57)	<0.001
Change in level after intervention	6.79 (-1.24 to 14.83)	0.06
Change in slope (per month) after intervention	-0.37 (-0.79 to 0.05)	0.05
Post-intervention slope (pre-intervention slope plus change in slope)	0.01 (-0.37 to 0.39)	0.97

Table A5- Effect of Dashboard on performance and validation Indicators: absolute and relative intervention effects with 95% CI at 30 months following introduction of intervention, and corresponding time period for external control indicators, in Ontario datasets, after exclusion of one data from one site with delayed data upload

Clinical performance indicator	Absolute difference from predicted (%) (95% CI for %)	Relative difference from predicted (%) (95% CI for %)
<i>Primary Analyses</i>		
Indicator 1- Unsatisfactory newborn screening samples*	0.42 (-2.16 to 2.99)	0.18 (-1.86 to 2.22)
Indicator 2- Episiotomy	-1.07 (-1.94 to -0.20)*	-1.11 (-0.25 to 0.03)
Indicator 3- Formula supplementation	0.02 (-1.05 to 1.11)	0.00 (-0.07 to 0.07)
Indicator 4- Elective repeat cesarean delivery prior to 39 weeks	-9.80 (-10.99 to -8.60)*	-0.22 (-0.27 to -0.18)*
Indicator 5- GBS screening	3.06 (2.42 to 3.70)*	0.03 (0.02 to 0.05)*
Indicator 6- Post-dates induction prior to 41 weeks	-13.15 (-17.15 to -9.15)*	-0.46 (-0.71 to -0.22)*
<i>Control Analyses</i>		
Internal control outcome #1: Cesarean in induced nulliparous women	-0.93 (-2.87 to 1.00)	-0.03 (-0.13 to 0.07)
Internal control outcome #2: Use of auscultation for fetal surveillance	-4.40 (-14.58 to 5.78)	-0.08 (-0.39 to 0.24)

*p<0.05

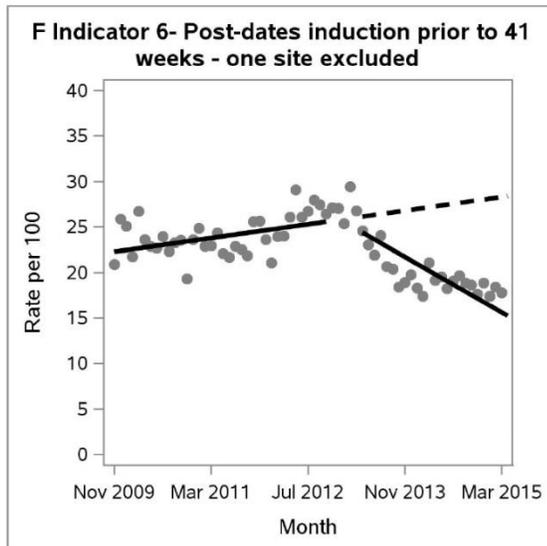
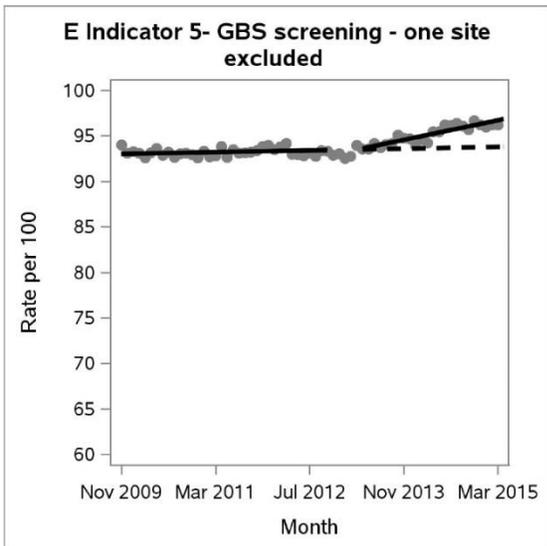
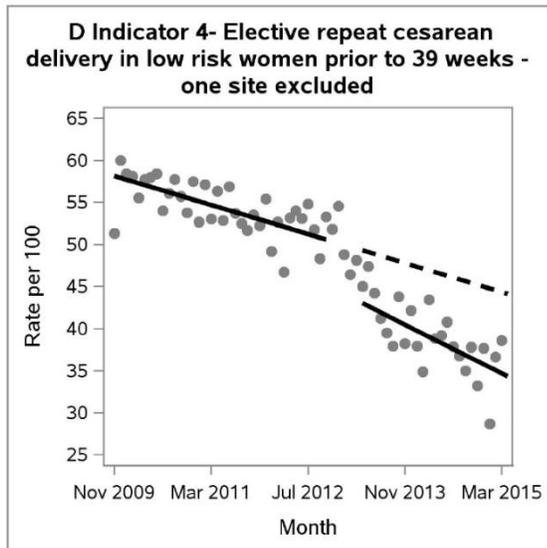
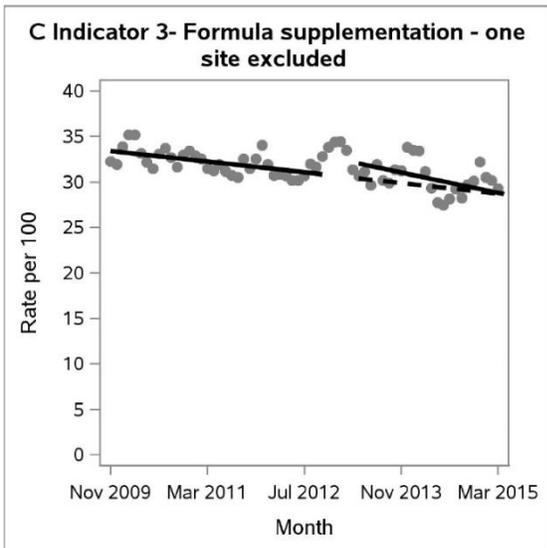
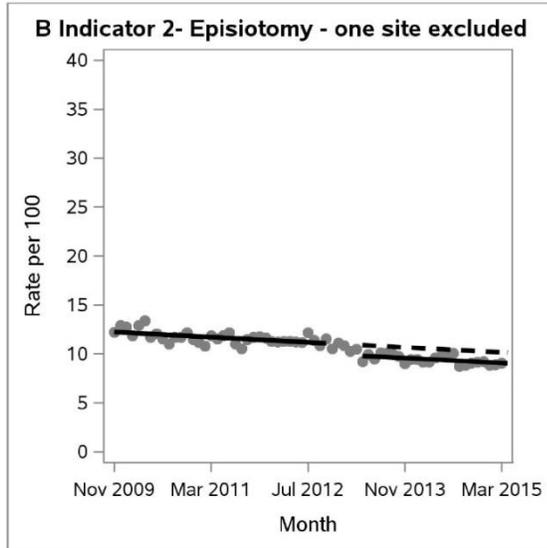
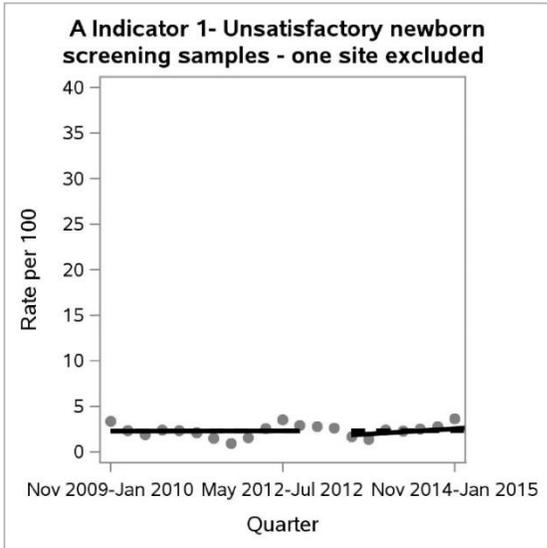


Figure A6- Analyses evaluating the effect of the implementation of the Maternal Newborn Dashboard on provincial rates of six clinical performance indicators, from November 2009 to March 2015, in Ontario, Canada, after exclusion of one site with delayed data entry. For each plot, the grey circles are the raw data per hundred births, the solid line is the fitted linear regression line, and the dashed line is the projected trend assuming there was no intervention (counterfactual).

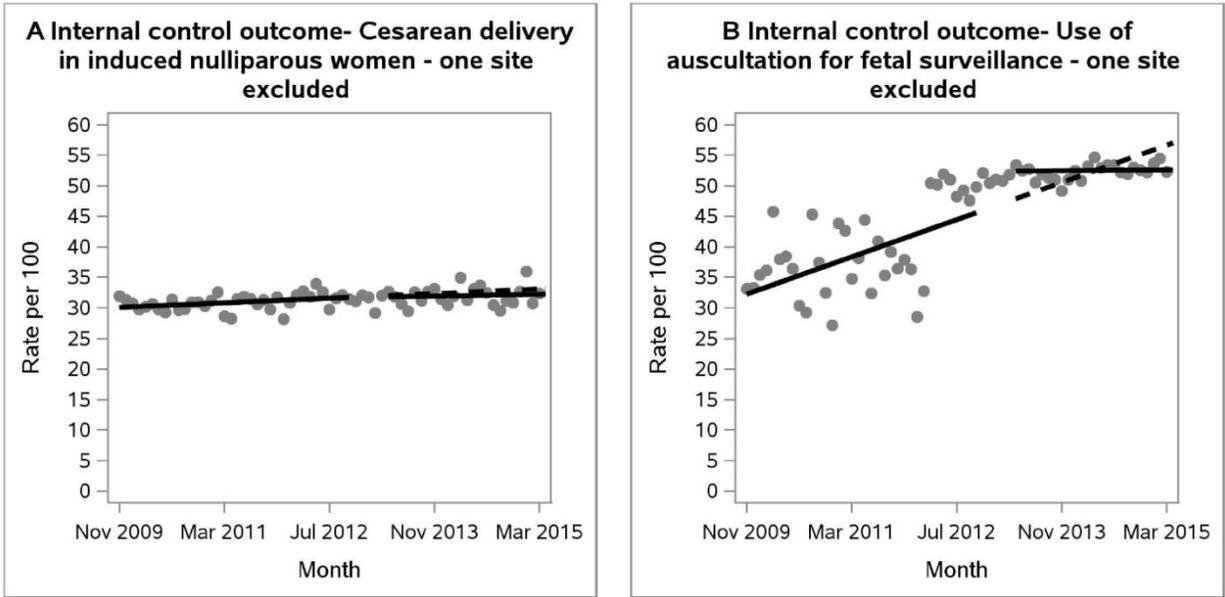


Figure A7- Analyses evaluating the effect of the implementation of the Maternal Newborn Dashboard on provincial rates (per hundred) of two internal control outcomes November 2009 to March 2015, in Ontario, Canada, after exclusion of one site with delayed data entry. For each plot, the grey circles are the raw data per hundred births, the solid line is the fitted linear regression line, and the dashed line is the projected trend assuming there was no intervention (counterfactual).

B) Revision of definitions to Performance Indicators 3, 4 and 5

Table A8- Results from segmented regression analysis for three clinical performance indicators from Ontario birth registry datasets, when indicator definitions were revised to reflect small changes to indicator definitions that occurred during the study period

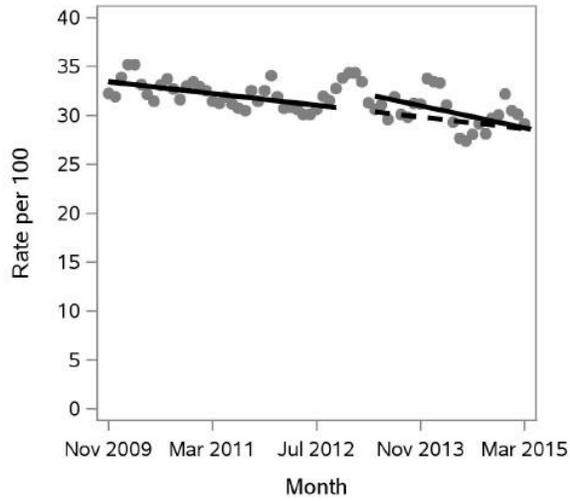
	Parameter estimate and 95% CI (%)	p-value
Indicator 3- Formula supplementation		
Intercept (baseline rate)	33.48 (33.15 to 33.82)	<0.001
Pre-intervention slope (per month)	-0.08 (-0.09 to -0.06)	<0.001
Change in level after intervention	2.02 (1.29 to 2.74)	<0.001
Change in slope (per month) after intervention	-0.07 (-0.11 to -0.02)	0.007
Post-intervention slope (pre-intervention slope plus change in slope)	-0.14 (-0.18 to -0.10)	<0.001
Indicator 4- Elective repeat cesarean delivery prior to 39 weeks		
Intercept (baseline rate)	58.35 (58.0 to 58.71)	<0.001
Pre-intervention slope (per month)	-0.22 (-0.23 to -0.20)	<0.001
Change in level after intervention	-5.64 (-6.44 to -4.83)	<0.001
Change in slope (per month) after intervention	-0.14 (-0.19 to -0.09)	<0.001
Post-intervention slope (pre-intervention slope plus change in slope)	-0.36 (-0.40 to -0.31)	<0.001
Indicator 5- GBS screening		
Intercept (baseline rate)	92.93 (92.65 to 93.20)	<0.001
Pre-intervention slope (per month)	0.02 (0.00 to 0.03)	0.04
Change in level after intervention	-0.45 (-1.04 to 0.14)	0.18
Change in slope (per month) after intervention	0.13 (0.10 to 0.17)	<0.001
Post-intervention slope (pre-intervention slope plus change in slope)	0.15 (0.12 to 0.18)	<0.001

Table A8- Effect of Dashboard on performance and validation Indicators: absolute and relative intervention effects with 95% CI at 30 months following introduction of intervention, and corresponding time period for external control indicators, in Ontario datasets, after revision of indicator definitions to reflect changes that were made during the study time period

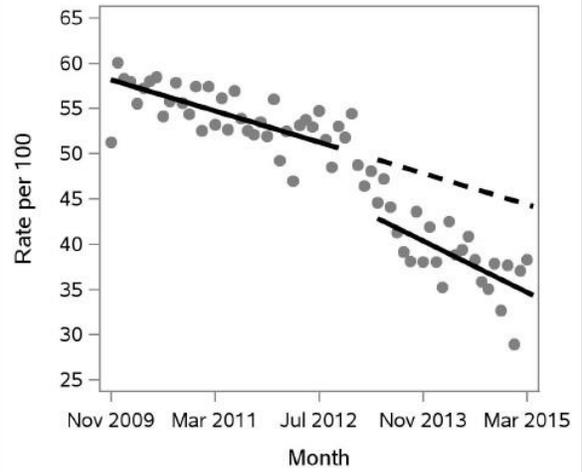
Clinical performance indicator	Absolute difference from predicted (%) (95% CI for %)	Relative difference from predicted (%) (95% CI for %)
Indicator 3- Formula supplementation	0.03 (-1.02 to 1.08)	0.00 (-0.07 to 0.07)
Indicator 4- Elective repeat cesarean delivery prior to 39 weeks	-9.83 (-10.86 to -8.80)*	-0.22 (-0.27 to -0.18)*
Indicator 5- GBS screening	3.57 (2.82 to 4.32)*	0.04 (0.02 to 0.05)*

*p<0.05

A Indicator 3- Formula supplementation - revised definition



B Indicator 4- Elective repeat cesarean delivery in low risk women prior to 39 weeks - revised definition



C Indicator 5- GBS screening - revised definition

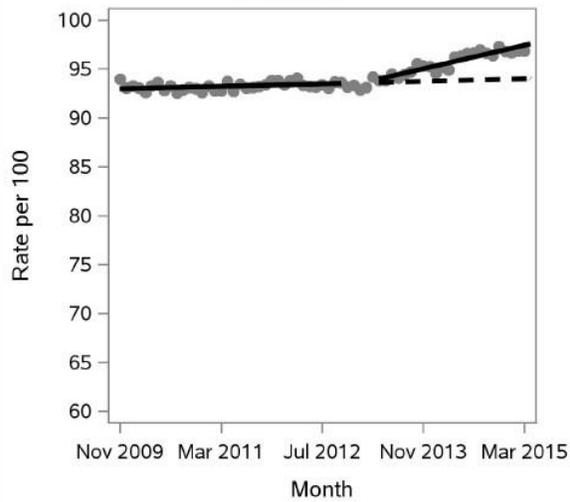


Figure A10- Analyses evaluating the effect of the implementation of the Maternal Newborn Dashboard on provincial rates of three clinical performance indicators, from November 2009 to March 2015, in Ontario, Canada, after revision of indicator definitions to reflect changes that were made during the study time period. For each plot, the grey circles are the raw data per hundred births, the solid line is the fitted linear regression line, and the dashed line is the projected trend assuming there was no intervention (counterfactual).