Supplemental Appendix 1: Details on IV method

The IV analysis relies on several assumptions. The first is that there be a strong association between the IV and endogenous variable—in our case there is a strong association between initial hospital breastfeeding experience and breastfeeding duration and exclusivity. The second assumption requires that the instrument be exogenous and is known as the exclusion restriction. This assumption requires that hospital breastfeeding experience only impact child weight status at age 2 through breastfeeding practices. The third assumption, the stable unit treatment value, requires that there is no interference from the instrument to the obesity outcomes of other children. The final assumption is monotonicity of the instrument. While we cannot test all of these assumptions, we outline our reasoning for why our chosen instrument is likely valid.

We can empirically show that we have satisfied the first assumption and do so in Supplemental Table 6. Establishment of early breastfeeding in the hospital is related to the breastfeeding duration and exclusivity through three main pathways. One pathway is based on whether the newborn child can latch onto the mom shortly after birth. This initial attachment establishes the mother's milk supply and is likely dependent on both the newborn's and the mother's postpartum interactions, but unrelated to mother's preferences. Another pathway is more systematic; whether the hospital and its staff have policies and practices in place to support the mother and child initial attempts to breastfeed, such as immediate skin-to-skin contact, in rooming, support for positioning, limiting access to formula when not medically indicated etc. Previous research suggests that without this support many mothers would not or could not initiate breastfeeding. Another pathway is based on whether the mother wants to breastfeed, which will likely determine her efforts in breastfeeding at the hospital. In the context of a state such as Oregon, where 96% of mothers ultimately initiate breastfeeding, there is likely to be very little selection on the kind of mother who wants to breastfeed (poor/rich, working/not working, educated/not educated, parity) because most mothers want to and do indeed breastfeed, and therefore those who do not are predominantly those who are unable to breastfeed due to breastfeeding difficulties. The few women for whom decisions not to breastfeed are related to socioeconomic or child health factors are controlled for through our use of extensive measured control variables in PRAMS.

There is no empirical test of the second assumption that exclusive breastfeeding in the hospital impact child obesity only through breastfeeding practices and not through other pathways such as mothers' preferences. If mothers' preferences determined her hospital breastfeeding experience or if mothers chose the birth hospitals based on the hospital's breastfeeding support policies then our instrument would not satisfy this assumption. To explore these issues, we conducted supplemental analyses using the Maternity Practices in Infant Nutrition and Care (mPINC) survey linked to the PRAMS data. The mPINC is a survey of maternity care practices and policies administered to all hospitals and birth centers with registered maternity beds and is conducted by the CDC. We requested the county of residence for each mother in PRAMS and mapped her to her county-level mPINC scores. The mPINC score was based on a weighted average of the hospitals in each county. We examined if the county-level policies from mPINC, which should be outside the mother's control, could predict whether the child was only given only breast milk in the hospital. We find that the policies do reflect actual practice at the hospitals, and this suggests that the hospital policy was indeed driving some of the hospital experience rather than just mothers' preferences. In addition, as long as mothers are not leaving their county of residence to select hospitals, then any selection into specific hospitals is likely to have little effect on breastfeeding experiences. As mentioned in the main text, much of the

mothers' breastfeeding experience in the hospital is likely dependent of the initial attempts to latch and the hospital support for the breastfeeding. In addition, 96% of mothers ultimately initiate breastfeeding in Oregon. Therefore there is likely to be very little selection on the kind of mother who wants to breastfeed. We control for many socioeconomic and child health characteristics that may be related to early breastfeeding experiences and preferences. Controlling for these key observable characteristic, mothers' hospital breastfeeding experience can be considered somewhat random and not dependent on her preferences.

The third assumption requires that the treatment, the breastfeeding practices of mothers during the newborn hospitalization, do not affect the obesity outcomes of other children. In our study, the breastfeeding practices of mothers during the newborn hospitalization should/do not affect the obesity outcomes of other children. The treatment takes place during a very short time window at the hospital, and we can think of no conceivable pathway where there could be interference from one mother's breastfeeding practices in the newborn hospitalization to the obesity outcomes for other mother's child.

The final assumption, monotonicity, is trivially satisfied because our instrument has only two levels.

Supplemental Appendix 2: Details on Sampling and Selection

The Oregon PRAMS data set uses complex sample weights to adjust for oversampling of underrepresented racial and ethnic populations, and low birth weight infants, and to adjust for non-respondents. Underrepresented racial and ethnic groups and low birth weight infants are oversampled. In addition to oversampling of underrepresented populations, Oregon PRAMS also adds a nonresponse weight to account for women who may be less likely to respond to the surveys. This weight is devised within each sampling stratum after comparing non- respondents with respondents and assumes that those who did not respond would have provided answers that are similar to those respondents who shared their demographic characteristics Finally, a non-coverage weight is applied to account for women who may have been excluded from the sampling frame due to accidental duplication in birth certificate records and missing files. The final weight is the product of these three weights (sampling, non-response, and non-coverage weights), and is applied to the entire dataset for all analyses. The weighted means in Table 1 were calculated using the sample weight function in STATA 13 (23).

While the sampling weights in the Oregon PRAMS allow for mean estimates to reflect population estimates, there is further selection in responses to questions that may undermine the representativeness of our analytical sample. Based on the PRAMS sampling design, the 885 mothers who responded to both surveys are representative of approximately 45,000 mothers. The sampling weights should make the 885 mothers representative of births in Oregon in 2009. The 493 mothers in the analytical sample for whom we have all the control variables of interest represent approximately 27,000 mothers. We explore the extent to which these two samples differ systematically. In Supplemental Table 2 we present the weighted means for each group for the main variables of interest and key demographic variables. While there are no difference in the main variables of interest such as child weight, breastfeeding or hospital experiences, there are differences in demographic variables such that the analytical sample is whiter, more educated and richer than the overall sample. Consequently we acknowledge that our findings, while internally consistent, may not be representative for all births in Oregon in 2009.

Supplemental Tables

Supplemental Table 1: Sample inclusion

Sample Inclusion Table	Observations	Observations Lost
In both waves of PRAMS and PRAMS-2	885	
Have weight measure	818	67
Have height measure	639	179
Have age for BMI and not outlier	625	14
Have all covariates	**493**	132
Have breastfeeding variables	**483**	10
Have hospital variables	**432**	51

* Final sample size depends on the regression specification.

121 Supplemental Table 2: Overall and Analytical Sample
122

	Weighted Overall Sample Oregon PRAMS with completed initial and follow-back surveys			Weighted Analytical Sample Oregon PRAMS with completed initial and follow-back surveys and no missing covariates		
	Mean	SE	N	Mean	SE	
Child Weight Variables						
Overweight	27%		624	24%		487
Child obese	12%		624	11%		487
Breastfeeding Practice Variables						
Ever Breastfed	94%		865	96%		493
Weeks Breastfed	38.73	1.77	863	40.76	1.92	487
Weeks Breastfed Exclusively	17.36	0.80	857	17.72	0.92	483
Hospital Experience Variable						
Hospital staff gave mom information about breastfeeding	94%		794	94%		452
My baby was fed only breast milk at the hospital	71%		792	74%		453
Hospital staff gave mom phone number to call about breastfeeding	87%		793	89%		453
Maternal Race/Ethnicity ***						
Non-Hispanic White	68%		884	76%		493
Hispanic	21%		884	14%		493
Non-Hispanic Asian/PI	6%		884	6%		493
Non-Hispanic Black	3%		884	1%		493
Non-Hispanic AI/AN	3%		884	2%		493
Income Groups***						
Less than $20,000	35%		852	22%		493
$20,000 to $34,999	19%		852	19%		493
$35,000 to $69,999	22%		852	26%		493
$70,000 or more	24%		852	33%		493
Maternal Education***						
Less than High School Graduate	19%		879	10%		493
High School Graduate	22%		879	23%		493
Some College	31%		879	30%		493
Bachelors or more	28%		879	38%		493
Paternal Education ***						
Less than High School Graduate	17%		800	12%		493
High School Graduate	24%		800	21%		493
Some College	30%		800	33%		493
Bachelors or more	28%		800	34%		493

*** $p<0.01$ across groups

123
124 Supplemental Table 3: Breastfeeding variables by weight groups
125

	Obese			Overweight			Normal			
	Mean	95% CI		Mean	95% CI		Mean	95% CI		N
Ever Breastfed*	86%	68%	100%	91%	82%	100%	98%	96%	100%	54
Weeks Breastfed	38.42	24.19	52.65	35.68	26.48	44.89	42.28	38.22	46.34	117
Weeks breastfed exclusively	16.18	10.60	21.76	14.13	10.90	17.36	18.78	16.64	20.93	360

126 *Estimates larger that 100% were capped.

Supplemental Table 4: Source of each variable

	Birth Certificate	PRAMS Survey	PRAMS-2 Survey
Weight and Breastfeeding Variables			
Child BMI			X
Child overweight			X
Child obese			X
Ever Breastfed			X
Weeks Breastfed			X
Weeks breastfed exclusively			X
Pregnancy Health			
Gestational diabetes during pregnancy	X		
Income Groups			X
Maternal Employment Status During Pregnancy			X
Maternal Race/ethnicity	X		
Maternal Marital Status	X		
Maternal Weight			X
Weight gain		X	
Maternal age at birth	X		
Maternal Education	X		
Paternal Education	X		
Child Birth Weight	X		
Number of Prenatal visits	X		
Number of Previous Live births	X		
Financial support			
Insurance at 3 months		X	
Child Ever WIC			X
Main Hospital Support Variables			
My baby was fed only breast milk at the hospital		X	
Hospital staff gave mom information about breastfeeding		X	

Supplemental Table 5: Hospital Breastfeeding Experience and Support Variables

Hospital Breastfeeding Encouragement Questions
Hospital staff gave me information about breastfeeding
My baby stayed in the same room with me at the hospital
I breastfed my baby in the hospital
I breastfed my baby in the first hour after my baby was born
Hospital staff helped me learn how to breastfeed
My baby was fed only breast milk at the hospital
Hospital staff told me to breastfeed whenever my baby wanted
The hospital gave me a gift pack with formula
The hospital gave me a telephone number to call for help with breastfeeding
My baby used a pacifier in the hospital

Supplemental Table 6: Associations between hospital policies and breastfeeding duration. Each cell presents the estimated coefficient from a single regression.

Hospital Variables, collected at 3 months	Weeks Breastfed (collected at 25 months or later)	Weeks Breastfed Exclusively (collected at 25 months or later)
Hospital staff gave me information about breastfeeding	-9.69	7.905**
	[8.407]	[2.698]
My baby stayed in the same room in hospital	1.57	2.619
	[8.140]	[4.143]
I breastfed my baby in the hospital	13.77	1.209
	[11.65]	[4.532]
I breastfed in the first hour after my baby was born	2.367	1.847
	[7.458]	[3.820]
Hospital staff helped me learn how to breastfeed	-5.087	-1.079
	[6.617]	[2.456]
My baby was fed only breast milk at the hospital	7.194*	8.847**
	[2.968]	[1.963]
Hospital staff told me to breastfeed whenever my baby wanted	2.479	-2.523
	[5.937]	[4.234]
The hospital gave me a gift pack with formula	-2.388	-1.833
	[4.422]	[2.368]
The hospital gave me a telephone number to call for help	-11.18	4.095
	[8.696]	[2.758]
My baby used a pacifier in the hospital	-3.712	-4.092
	[2.254]	[2.605]
Observations in each of 20 regressions	438	432

Results in the table are from 20 individual regressions.

In each cell the estimated coefficient between a hospital policy and breastfeeding duration or duration exclusivity is presented. All regression models include control variables for mother's income, mother's education, mother's employment, mother's marital status, mother's age, mother's weight, mother's height, mother's weight gain during pregnancy, mother's parity, number of prenatal visits, mother's insurance status, mother's gestational diabetes, child's race, child's birth weight, child's ever being on WIC, father's education and county of residence fixed-effects. Weighted standard errors in brackets.

** $p<0.01$, * $p<0.05$, $^{\alpha}$ $p<0.1$

Supplemental Table 7: Association between Breastfeeding Practices and Obesity Status at age 2.

	LOGISTIC REGRESSION MODEL- ODDS RATIOS PRESENTED					
VARIABLES	Overweight			Child obese		
Ever Breastfed	0.411$^{\alpha}$			0.0907**		
	[0.152 - 1.107]			[0.0208 - 0.395]		
Weeks Breastfed		0.987**			0.989	
		[0.979 - 0.995]			[0.976 - 1.003]	
Weeks Breastfed Exclusively			0.977			1.004
			[0.947 - 1.007]			[0.976 - 1.032]
Gestational diabetes during pregnancy						
	0.364$^{\alpha}$	0.401	0.367	1.103	1.164	0.891
	[0.113 - 1.168]	[0.0985 - 1.635]	[0.0912 - 1.473]	[0.267 - 4.568]	[0.273 - 4.964]	[0.181 - 4.374]
Income Groups						
$20,000 to $34,999	0.251$^{\alpha}$	0.32	0.354	0.130**	0.107**	0.125**
	[0.0529 - 1.193]	[0.0522 - 1.959]	[0.0674 - 1.862]	[0.0312 - 0.544]	[0.0239 - 0.476]	[0.0286 - 0.546]
$35,000 to $69,999	0.806	0.966	1.097	0.768	0.867	0.965
	[0.217 - 2.993]	[0.197 - 4.732]	[0.240 - 5.005]	[0.192 - 3.067]	[0.245 - 3.074]	[0.298 - 3.117]
$70,000 or more	0.387	0.322	0.423	0.138**	0.189$^{\alpha}$	0.283
	[0.0846 - 1.774]	[0.0442 - 2.342]	[0.0534 - 3.349]	[0.0226 - 0.841]	[0.0345 - 1.034]	[0.0510 - 1.576]
Marital Status						
Not Married	2.613*	2.762*	2.852*	4.457**	4.919**	5.245**
	[1.095 - 6.238]	[1.118 - 6.823]	[1.146 - 7.101]	[1.772 - 11.21]	[2.148 - 11.26]	[2.254 - 12.20]
Maternal Weigh gain during pregnancy	0.999	1.001	1.002	1.002	1.002	1.006
	[0.968 - 1.031]	[0.971 - 1.032]	[0.969 - 1.036]	[0.969 - 1.036]	[0.963 - 1.042]	[0.966 - 1.048]
Maternal Weight	1.000	0.995*	0.996	1.007	1.003	1.003
	[0.994 - 1.006]	[0.990 - 1.000]	[0.990 - 1.002]	[0.997 - 1.017]	[0.993 - 1.014]	[0.993 - 1.014]
Mom Height	0.999	0.998	0.997	0.992	0.994	0.992
	[0.990 - 1.008]	[0.987 - 1.009]	[0.987 - 1.007]	[0.981 - 1.002]	[0.984 - 1.004]	[0.982 - 1.003]
Child Birth weight	1.001	1.001$^{\alpha}$	1.001	1.002**	1.002**	1.001**
	[1.000 - 1.001]	[1.000 - 1.002]	[1.000 - 1.002]	[1.000 - 1.003]	[1.001 - 1.003]	[1.000 - 1.002]
Financial support						
Child Ever WIC	0.731	1.246	1.447	1.05	0.863	1.054
	[0.237 - 2.253]	[0.324 - 4.792]	[0.392 - 5.339]	[0.378 - 2.921]	[0.352 - 2.117]	[0.442 - 2.513]
No Insurance	3.084**	3.531**	3.334**	4.455$^{\alpha}$	5.196*	5.791*
	[1.534 - 6.201]	[1.472 - 8.473]	[1.452 - 7.654]	[0.998 - 19.90]	[1.112 - 24.28]	[1.450 - 23.13]
Observations	486	456	451	436	436	433
County FE	YES	YES	YES	YES	YES	YES
Model	Logistic Regression	Logistic Regression	Logistic Regression	Logistic Regression	Logistic Regression	Logistic Regression

Controlling for parity, prenatal visits, father's education, mother's age, mother's education, mother's employment status, child's race and county of residence fixed-effects.
Robust and weighted 95% confidence intervals in brackets. ** p<0.001 * p<0.01, $^{\alpha}$ p<0.05

Supplemental Table 8: Extended results from first-stage regressions

VARIABLES	First Stage Regressions	
	Weeks Breastfed	Weeks breastfed exclusively
My baby was fed only breast milk at the hospital	7.182$^{\alpha}$	8.893**
	[-0.461-14.825]	[5.004-12.782]
Gestational diabetes during pregnancy	4.142	1.085
	[-8.536-16.819]	[-5.301-7.471]
Income Groups		
20000 to 34999	-2.467	-2.081
	[-12.602-7.667]	[-6.299-2.138]
35000 to 69999	-2.38	-1.551
	[-15.881-11.121]	[-9.271-6.17]
70000 or more	-6.465	-0.465
	[-20.39-7.46]	[-7.33-6.4]
Marital Status		
Not Married	-4.54	-2.614
	[-13.394-4.313]	[-6.358-1.131]
Maternal Weigh gain during pregnancy	-0.225	-0.112
	[-0.482-0.032]	[-0.102--0.008]
Maternal Weight	-0.147*	-0.0551$^{\alpha}$
	[-0.246 - -0.048]	[-0.273-0.049]
Child Birth weight	0.00863$^{\alpha}$	0.00287$^{\alpha}$
	[0.002-0.016]	[0-0.006]
Financial support		
Child Ever WIC	-9.496	-1.241
	[-20.327-1.334]	[-6.402-3.92]
No Insurance at two months	3.025	-3.318
	[-7.281-13.33]	[-6.72-0.085]
Observations	439	441
Model	xtreg	xtreg

Ordinary least squares models control for parity, number of prenatal visits, father's education, mother's age, mother's education, mother's employment status, mother's height, child's race and county of residence. Robust 95% confidence intervals in brackets. ** $p<0.001$ * $p<0.01$, $^{\alpha}$ $p<0.05$

Supplemental Table 9: Sensitivity Analysis of Instrumental Variable Estimates on the Effect of Breastfeeding Exclusivity on Child Obesity Status at age 2

	1 Instrument BFH5ONLY (+)	2 Instruments BFH5ONLY(+) BFH5INFO(+)
Panel A. Child overweight		
Weeks of breastfeeding exclusivity	-0.008	-0.0106$^{\alpha}$
	[-.019 - .003]	[-0.023 - 0.002]
Panel B. Child obese		
Weeks of breastfeeding exclusivity	-0.0066$^{\alpha}$	-0.0064
	[-.014- .001]	[-0.016 - 0.003]
F-statistic of excluded instrument(s)	21.94	13.54
County FE	YES	YES
Pass over-identification test		YES

Estimates from instrumental variables linear probability models.
Models control for mother's income, mother's education, mother's employment, mother's marital status, mother's age, mother's weight, mother's height, mother's weight gain during pregnancy, mother's parity, number of prenatal visits, mother's insurance status, mother's gestational diabetes, child's race, child's birth weight, child's ever being on WIC, father's education and county of residence fixed-effects.
Weighted standard errors clustered at the county level are used to calculate confidence intervals.
** $p<0.01$, * $p<0.05$, $^{\alpha}$ $p<0.1$

Supplemental Table 10: Reduced Form Regressions for hospital experience and child weight outcomes

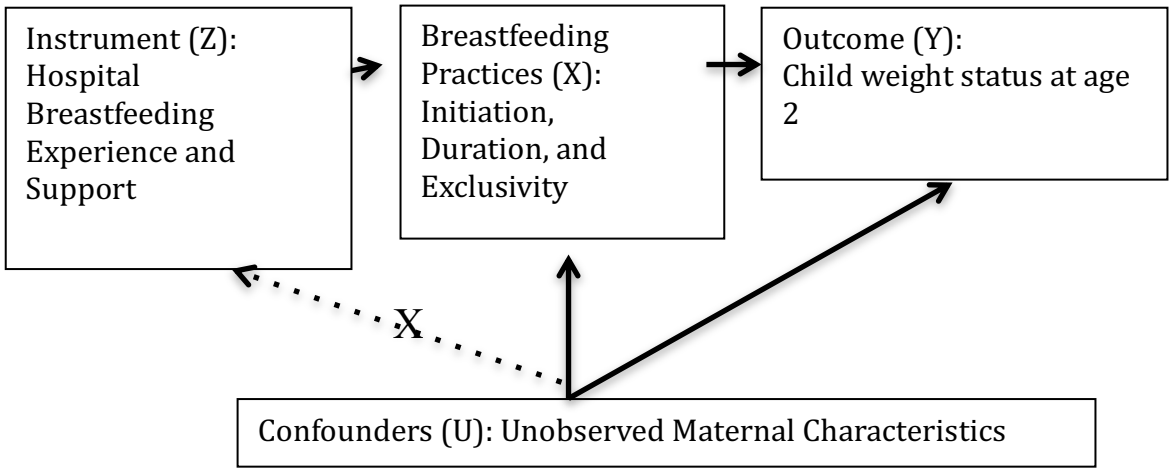
	Overweight	Child obese
My baby was fed only breast milk at the hospital	-0.0676$^{\alpha}$	-0.0513*
	[-0.139 - 0.00340]	[-0.0975 - -0.00521]
Gestational diabetes during pregnancy	0.0829	0.140**
	[-0.116 - 0.282]	[0.0290 - 0.252]
Income Groups		
20000 to 34999	-0.137$^{\alpha}$	-0.132**
	[-0.293 - 0.0187]	[-0.231 - -0.0334]
35000 to 69999	-0.128	-0.0891
	[-0.328 - 0.0722]	[-0.233 - 0.0548]
70000 or more	-0.146	-0.0737
	[-0.361 - 0.0687]	[-0.228 - 0.0809]
Marital Status		
Married	0.0678	0.0536*
	[-0.0916 - 0.227]	[0.000282 - 0.107]
Maternal Weigh gain during pregnancy	0.00243	0.000947
	[-0.00121 - 0.00606]	[-0.000663 - 0.00256]
Maternal Weight	0.000121	0.0000151
	[-0.000773 - 0.00102]	[-0.000727 - 0.000757]
Child Birth weight	9.63e-05*	7.41e-05**
	[1.31e-05 - 0.000180]	[2.65e-05 - 0.000122]
Financial support		
Child Ever WIC	0.0561	0.0720$^{\alpha}$
	[-0.115 - 0.227]	[-0.00715 - 0.151]
No Insurance at two months	0.0555	-0.0101
	[-0.0338 - 0.145]	[-0.0716 - 0.0515]
Observations	441	441
Model	xtreg	xtreg
County FE	YES	YES

Linear regression models controlling for parity, prenatal visits, father's education, mother's age, mother's education, mother's employment status, mother's height, child's race, and county of residence.

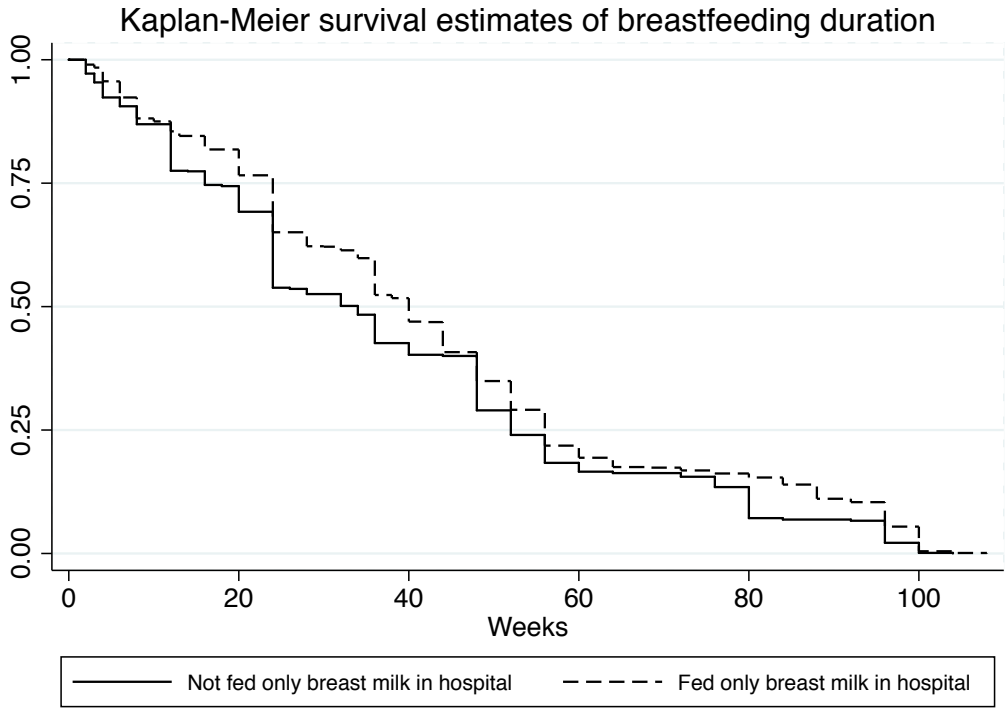
Robust clustered 95% confidence intervals in brackets. ** p<0.01, * p<0.05, $^{\alpha}$ p<0.1

Supplemental Figures

Supplemental Figure 1: Conceptual diagram of IV estimation



Supplemental Figure 2: Duration of Breastfeeding & Breastfeeding Exclusivity by Breastfeeding Experience in Hospital
Panel A: Survival Plot of Duration of Breastfeeding by Breastfeeding Experience in Hospital



Panel B: Survival Plot of Duration of Breastfeeding Exclusivity by Breastfeeding Experience in Hospital