

## Background & Objectives

- A rural disadvantage emerged in the early 1980's, in both infant mortality rates and low birth weight births.
- Few studies have examined the effects of closure of rural obstetric services.
- This study compares trends in the distribution of obstetric facilities and birth outcomes in rural and urban counties to ascertain the association of rural disadvantage in birth outcomes with available obstetric services.

## Method

- Secondary analysis of county-level data from the Centers for Disease Control and Prevention, County Health Rankings National Data, and the Area Health Resource File between 1996 and 2013.
- Dependent variables: 5-year Infant mortality rates (IMR), and 3-year Low birth weight births rates (LBWBR).
- Independent variables: facilities (hospital bed-population ratios; obstetric care units-population ratios), facilities changes, in four subgroups: no-change, dual (gain and loss), gain, and loss, times of change (dummy variables for times of change in facilities), year, and base-year adjusted years (reset the base year to the previous year of each change).
- Covariates: unemployment rates, poverty proportion, 3-year teen birth rates, obstetric/gynecologists rates, rates of births in hospitals.
- 2013 Rural Urban Continuum Code (RUCC) was used to classify counties into rural (RUCC $\leq$ 3) and urban (RUCC>3) areas.
- Analysis: trend description, univariate linear regression, and an analysis of covariance model.

## Results-Trends

### Facilities:

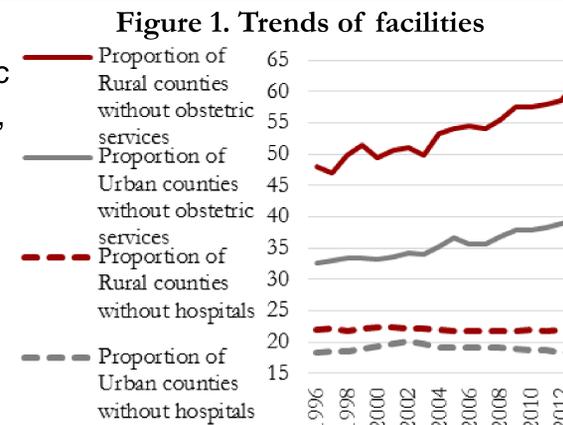
- The proportion of counties with no obstetric care increased 35% among rural counties, versus 22% among urban between 1996 and 2013.
- The proportion of counties without a hospital changed only slightly. (Figure 1)

### Birth Outcomes:

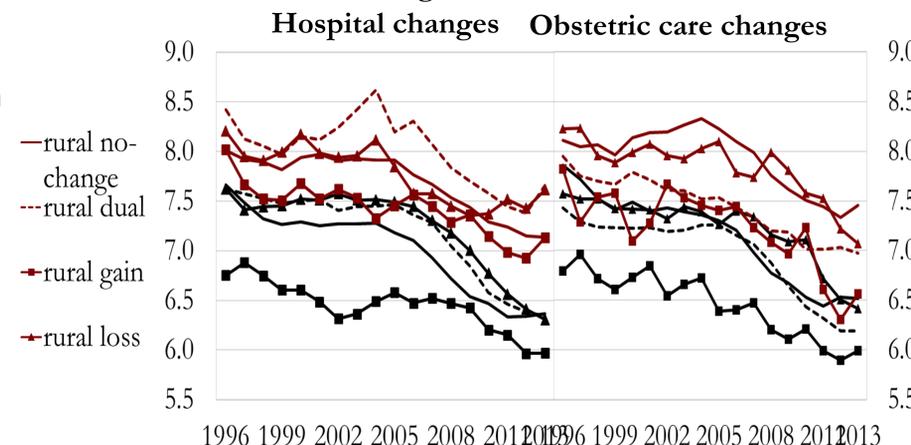
- Over the same period, the rural IMRs decreased by 11.81% (from 8.05 to 7.20), and urban IMRs by 19.94% (from 7.58 to 6.32). LBWBR increased from 1996 through 2006 in both rural (14.93%, from 73.27 to 84.21) and urban (12.71%, from 73.39 to 82.72) counties, and declined (rural: 2.72%, from 84.21 to 81.92; urban: 3.23%, from 82.72 to 80.05) thereafter.

- Stratified by facility changes, urban counties in the gain group had obvious advantage in both birth outcomes. (Figure 2 and 3)

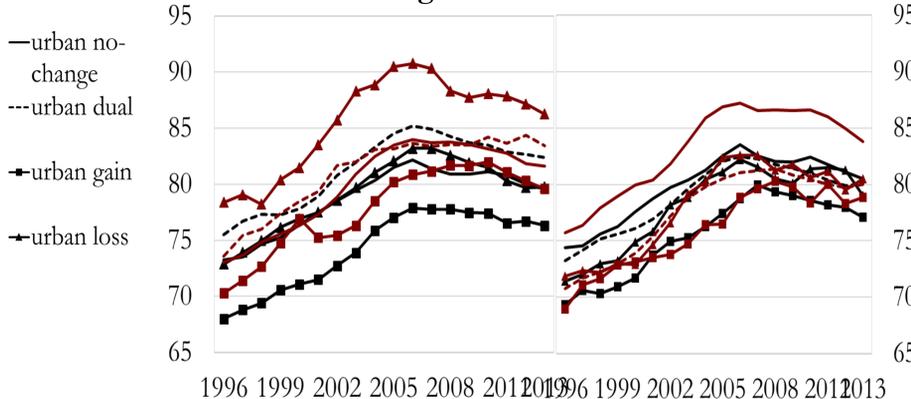
- On the contrary, rural no-change group for obstetric services showed obvious disadvantage in both birth outcomes, given high proportion of rural counties had no obstetric services. (Figure 2 and 3)



**Figure 2. Trends of IMRs**



**Figure 3. Trends of LBWBRs**



## Results-Associations

- IMRs went down (both  $-.04^{***}$ ), and the LBWBR went up for rural ( $1.14^{***}$ ) and urban births ( $1.00^{***}$ ) over time.
- Obstetric care unit availability was a protective factor for rural IMR ( $-.03^{***}$ ) and LBWBR ( $-.58^{***}$ ), and urban LBWBR ( $-.63^{***}$ ).
- Hospital loss raised rural LBWBR intercept ( $1^{st}$  loss:  $5.36^{***}$ ) and reduced urban IMR slope ( $4^{th}$  loss:  $-.59^*$ );
- Hospital gain reduced rural LBWBR for  $1^{st}$  gain ( $-4.59^{***}$ ), and urban birth outcomes for the first two gains, but it raised urban LBWBR slope for  $2^{nd}$  gain ( $.84^{***}$ ).
- Gain in obstetric care increasingly reduced urban intercepts, and rural IMR slopes. But it raised urban slopes.

Note: \*, \*\* and \*\*\* denote statistical significance at 0.05, 0.01 and 0.001 level, respectively, for t-test.

## Conclusion

- Rural areas experienced worsened access to obstetric care from 1996 to 2013 concurrently with worsening disadvantages in birth outcomes.
- Policy to address the disparity of birth outcomes between rural and urban areas is warranted.

