Estimating Women's Eligibility for WIC: Postpartum and Breastfeeding Women
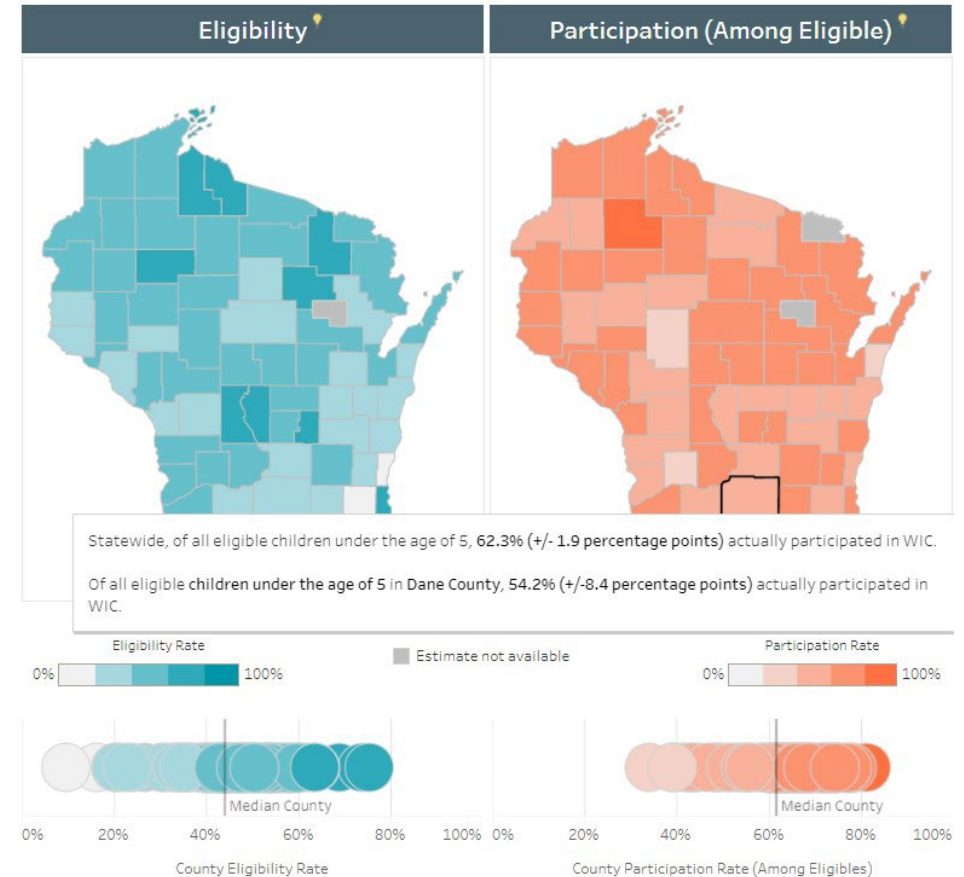
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U.S. Census Bureau

Any opinions and conclusions expressed herein are those of the authors and do not reflect the views of the U.S. Census Bureau. This analysis uses only publicly available data.

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

- WIC serves 11 million women, infants, and children nationally (Gray et al., 2022)

- 85% of eligible postpartum and 52% of eligible pregnant women participate (Gray et al., 2022)

- Current Census research product estimates infants and children eligible for and accessing WIC
  - Linked administrative and survey data
  - Substate estimates by county, demographics
  - → Identify the underserved
  - Eligible women not estimated

| Eligibility | Participation (Among Eligible) |

Statewide, of all eligible children under the age of 5, 62.3% (+/- 1.9 percentage points) actually participated in WIC.

Of all eligible children under the age of 5 in Dane County, 54.2% (+/-8.4 percentage points) actually participated in WIC.

Eligibility Rate   Estimate not available   Participation Rate
0%   100%   0%   100%

County Eligibility Rate   County Participation Rate (Among Eligibles)

Source:https://www.census.gov/library/visualizations/interactive/wic-eligibility-participation.html

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Eligibility

Developing estimates of WIC-eligible women presents some challenges

- Categorical eligibility
  - Pregnant
  - Postpartum (up to 6 months after end of pregnancy)
  - Breastfeeding (up to infant's first birthday)

- Data availability

Objective: Identify postpartum women in the ACS and develop a predictive model to estimate the number of those who are breastfeeding infants between 6-12 months of age

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Correlates of Breastfeeding

+ Older maternal age, being married, higher education level, and access to private insurance (Jones et al, 2015)
+ NH-White and Hispanic (Li et al., 2019)
+ Foreign-born (Singh et al., 2007)
+ Non-English speaking household (Parasuraman et al., 2020)

- NH-Black (Li et al., 2019)
- Poverty (McKinney et al., 2016)
- Acculturation among foreign born (Singh et al., 2007)
- Single mother, and lower household education (Parasuraman et al., 2020)

Model Development: National Survey of Children's Health (NSCH) 2017-2019

- Household survey, U.S. Department of Health and Human Services

- Produces national estimates on the physical and emotional health of children

- Questions to identify breastfed infants and breastfeeding duration:
  - Was this child EVER breastfed or fed breast milk?
  - How old was this child when they COMPLETELY STOPPED breastfeeding (or are they STILL breastfeeding)?

Model Application: American Community Survey (ACS) 2019 1-Year Public Use Microdata Sample

- Household survey, U.S. Census Bureau

- Produces estimates on the socio-demographic, economic, and housing characteristics of the US population

- Allows us to identify income-eligible and their demographic characteristics; currently used to estimate characteristics of WIC-eligible infants and children

- Questions to identify postpartum women and presence of their infants
  - In the PAST 12 MONTHS, has this person given birth to any children?
  - What is Persons n's age?

Analytic Sample

NSCH 2017 - 2019

Restrict to children ages 0 to 4 years living in households with mothers present:

- 17,000 obs, representing 17.2 million children; 44.67% were breastfed 6 months or longer

Split into training and testing sample, drawing randomly from within strata (Wieczorek et al., 2022)

- ⅔ training
- ⅓ hold out sample

ACS 2019

Restrict to infants living in households with mothers present:

- 26,000 observations representing 3.1 million infants and 2.8 million postpartum women

Features for Model Development (NSCH 2017-2019)

Time of survey

Mom's employment status, mom's education, mom's marital status, state of residence, total number of children in the household, number of individuals in the household, household language, mom's military status, child's health insurance status, ratio of household income to federal poverty line, whether household is accessing SNAP

Time of birth

Mom's age, mom's duration in the U.S., sex of infant, race and ethnicity, nativity of mom (and household), number of older siblings

Target Being breastfed 6 months or longer

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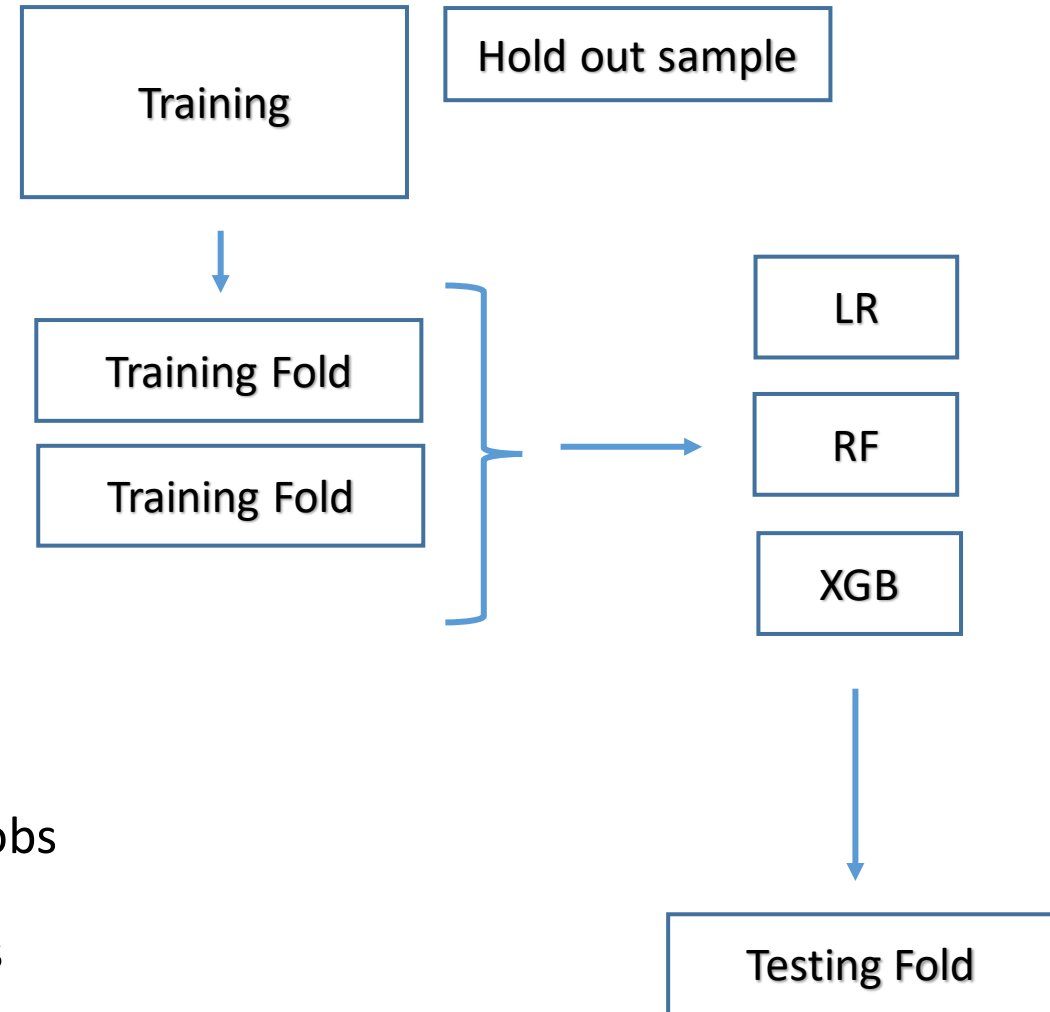
Model Development

Models

- Logit (LR)
- Random Forest (RF)
- Extreme Gradient Boosting (XGB)

Two approaches in model training

- "Full" : age 4 and younger
  - Training, testing samples ~7600 obs, ~3800 obs
- Restricted: age 6-12 months
  - Training, testing samples ~560 obs, ~280 obs

Both approaches are validated (3-fold cross validation) on subsample of 6-12 month olds

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NSCH 2017 -2019

Results

Model	Training Sample	Testing Sample	Mean Accuracy	Mean AUC	Mean Log Loss
LR	Full	Restricted	0.53	0.54	14.81
LR	Restricted	Restricted	0.64	0.65	12.50
RF	Full	Restricted	0.52	0.52	16.75
RF	Restricted	Restricted	0.64	0.64	12.50
XGB	Full	Restricted	0.52	0.52	16.51
XGB	Restricted	Restricted	0.62	0.63	13.04

Source: Authors' estimates, NSCH 2017-2019

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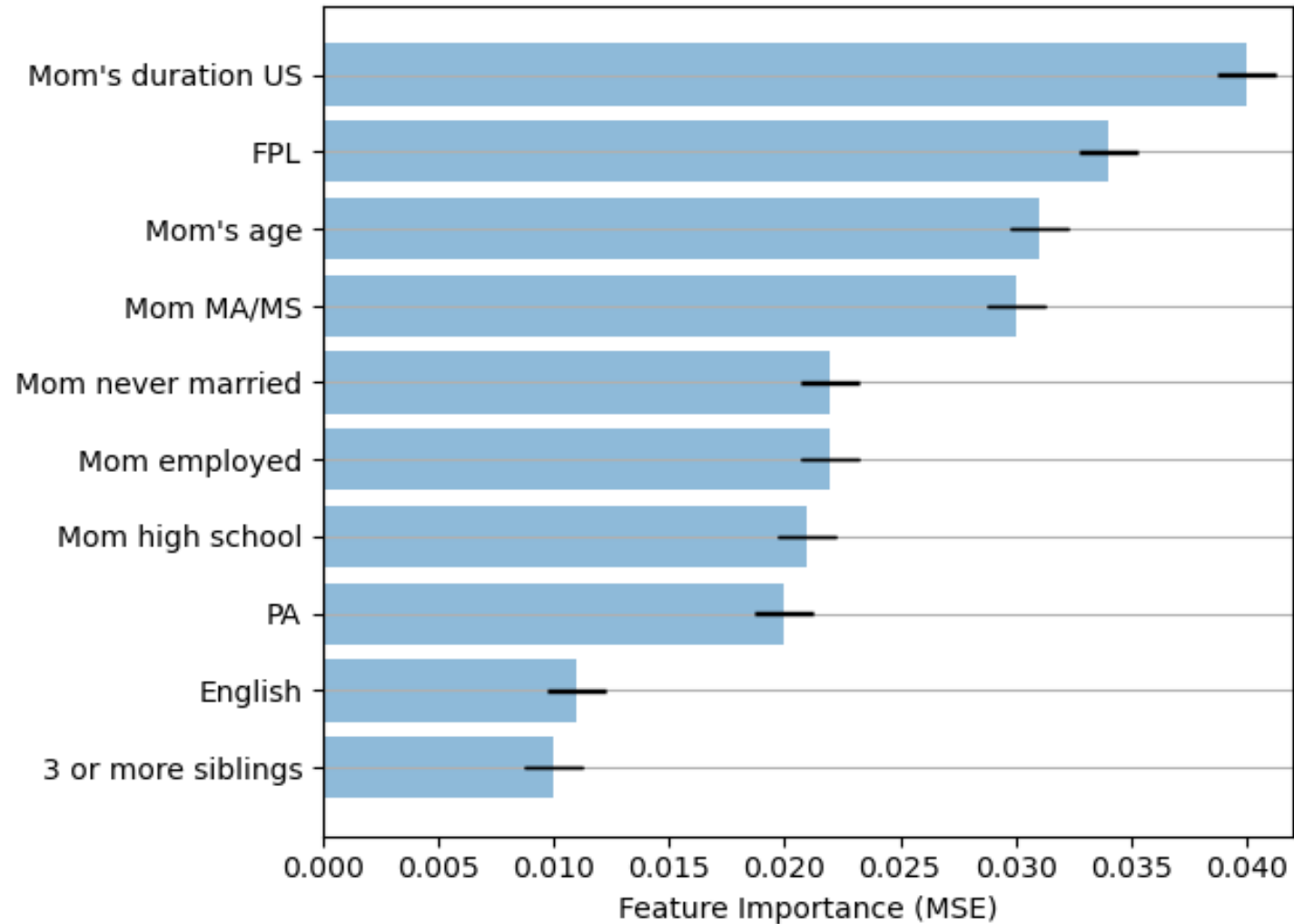| Model	Training Sample	Testing Sample	Mean Accuracy	Mean AUC	Mean Log Loss
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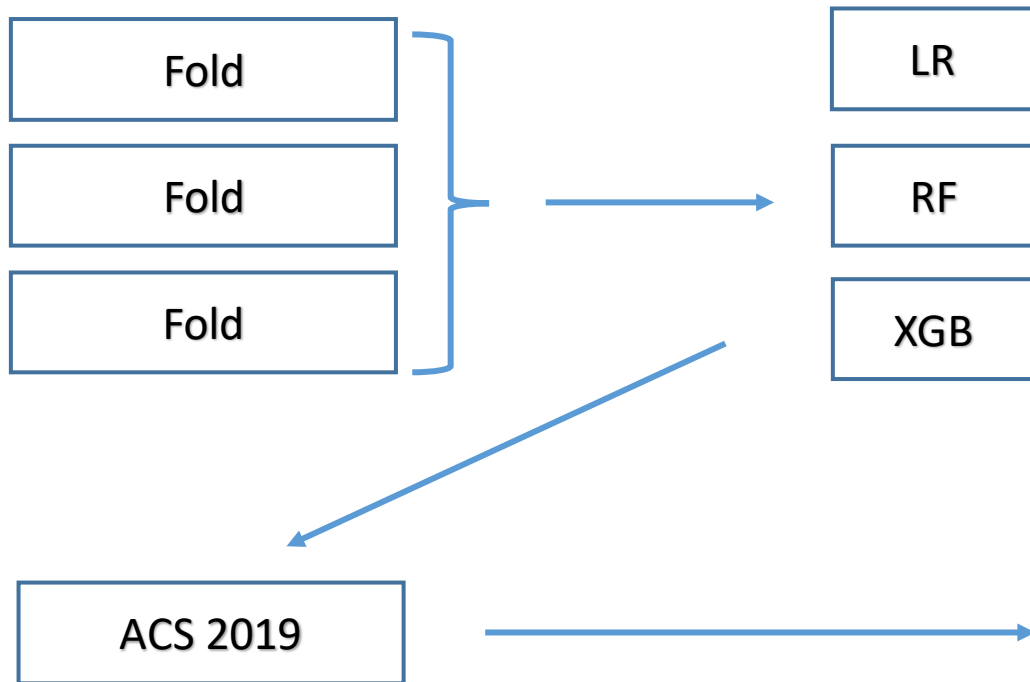Source: Authors' estimates, NSCH 2017-2019

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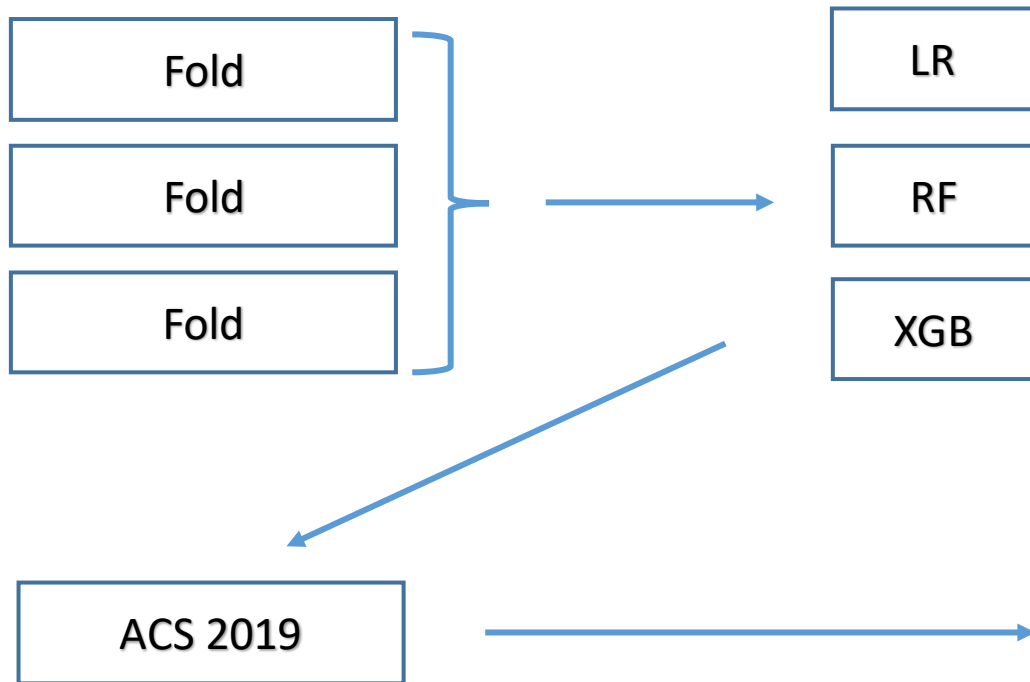Source: Authors' estimates, NSCH 2017-2019

XGB Feature Importance

Applied to ACS 2019 1-Year, Infants with Mothers Present

Source	Estimate (%)	St Err (%)
CDC	55.8	--
NSCH	52.0	1.7
LR	40.7	0.3
RF	35.8	0.3
XGB	41.2	0.3

Source: CDC 2022 Breastfeeding Report Card, Authors' estimates, NSCH 2017-2019, ACS 2019 1-Year PUMS

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Limitations

- We can't separate biological and adoptive mothers in the NSCH

- NSCH provides estimates of *being breastfed*, not the breastfeeding practices of mothers

- Known undercount of infants and young children in survey data (census.gov, 2021) → will lead to undercount of postpartum and breastfeeding women

Conclusion

- Promising start on identifying postpartum and breastfeeding women; room for improvement

Next steps

- Finalize models (hyperparameter tuning)
- Move to restricted use ACS and NSCH
- Compare predictive model with NSCH-ACS linked estimates
- Apply income-eligibility criteria to identify WIC-eligible postpartum and breastfeeding populations

References

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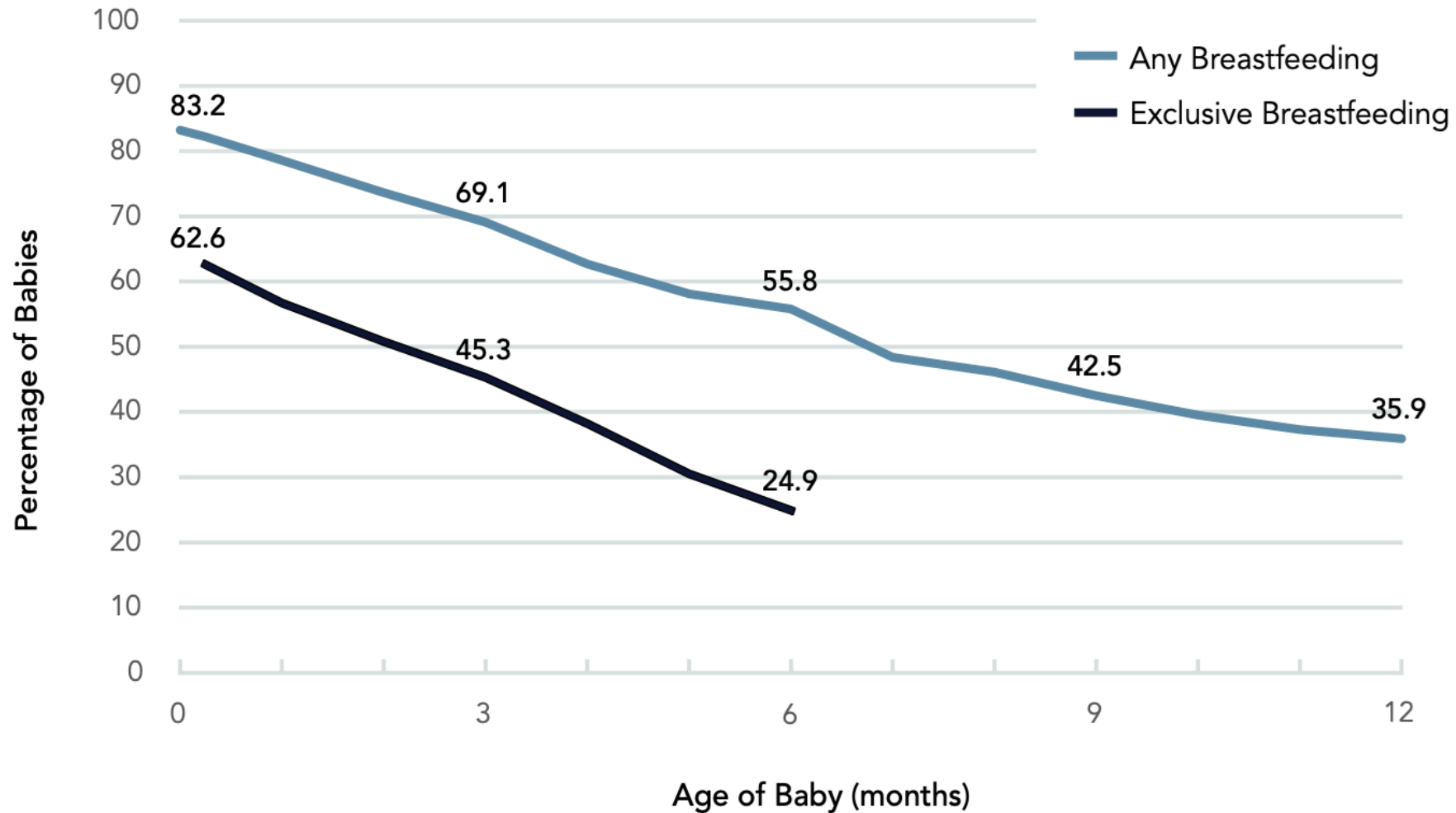
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CDC Estimates (National Immunization Survey 2019)

Source: CDC 2022 Breastfeeding Report Card

ROC/AUC