Prescription Medication Use and Baseline Health Status of Women with Live Birth Deliveries in a National Data Network: The Sentinel Distributed Database Mother-Infant Linkage Table

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Disclosures

- The views expressed in this presentation represent those of the presenters and do not necessarily represent the official views of the U.S. FDA.

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FDA Sentinel's Mother-Infant Linkage Table

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- The Sentinel Distributed Database (SDD) is a national data network of routinely collected electronic health data in the US, including administrative claims data

- In order to study maternal drug exposures during pregnancy and infant outcomes such as major congenital malformations, it is necessary to link mother and infant records

- The Sentinel Common Data Model was expanded in 2018 to include a table of linked mother-infant pairs

Project Aims

1. To characterize the mothers with live-birth deliveries included in the Mother-Infant Linkage table on baseline health status and maternal medication use
2. To informally compare characteristics between live-birth deliveries that could and could not be linked to an infant
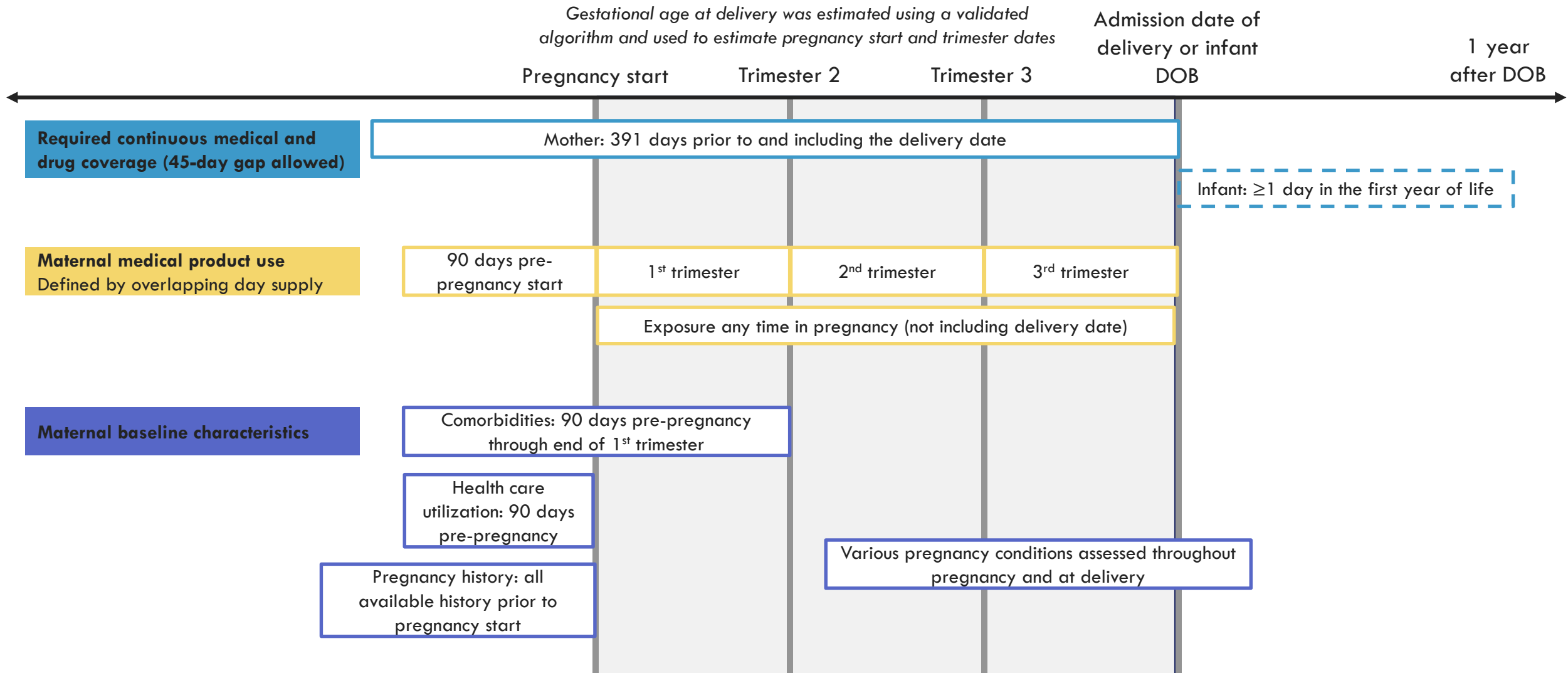
Methods

Data Source and Linkage to Infant

- Data source: the Sentinel Distributed Database
  - Included 6 Data Partners that populated the Mother-Infant Linkage table at the time of analysis
  - Administrative claims from privately and publicly insured women
- Linkage of live birth deliveries to infants was completed at each Data Partner site using member data
- From the Mother-Infant Linkage table, we selected all singleton live birth deliveries for analysis
  - This includes women aged 10-54 years at the time of live birth delivery from January 1, 2000, through December 31, 2019
- Created two cohorts for further analysis:
  - "Linked": singleton live birth deliveries that were successfully linked to an infant
  - "Not linked": singleton live birth deliveries that were unable to be linked to an infant

- This analysis was designed on Sentinel Query Request Package (QRP) v. 9.5.0.

Maternal Conditions and Medications

- **Baseline health conditions and lifestyle factors:** definitions were based on Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse lists, and modified to include pregnancy specific codes where applicable

- **Pregnancy-related conditions:** defined using validated claims algorithms, when available

- **Pregnancy history:** evidence of a code for a previous pregnancy outcome
  - Reflects what information is available in the database – we may be missing history prior to enrollment

- **Medications:** were grouped broadly by indication and class and include outpatient pharmacy dispensings only

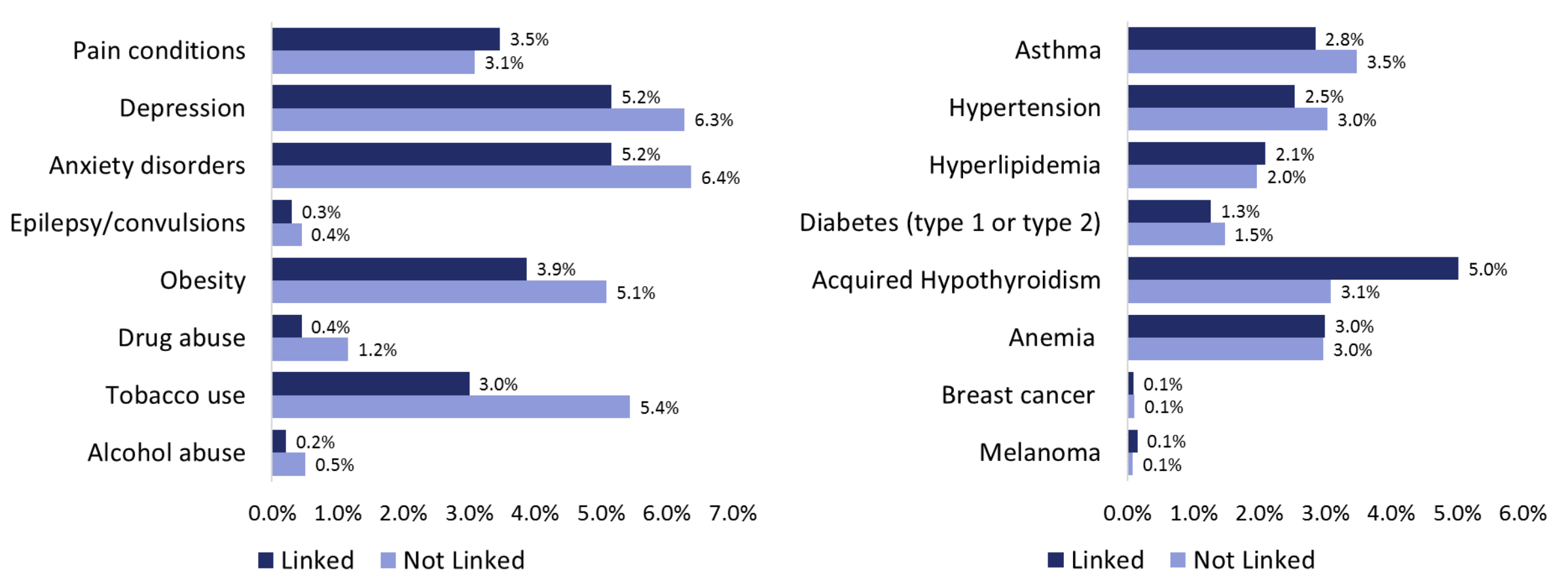# Study Design For Assessment Of Maternal Conditions And Medication Use

Gestational age at delivery was estimated using a validated algorithm and used to estimate pregnancy start and trimester dates

Admission date of delivery or infant DOB

1 year after DOB

Pregnancy start | Trimester 2 | Trimester 3

Required continuous medical and drug coverage (45-day gap allowed)
Mother: 391 days prior to and including the delivery date
Infant: ≥1 day in the first year of life

Maternal medical product use
Defined by overlapping day supply
90 days pre-pregnancy start | 1st trimester | 2nd trimester | 3rd trimester
Exposure any time in pregnancy (not including delivery date)

Maternal baseline characteristics
Comorbidities: 90 days pre-pregnancy through end of 1st trimester
Health care utilization: 90 days pre-pregnancy
Pregnancy history: all available history prior to pregnancy start
Various pregnancy conditions assessed throughout pregnancy and at delivery

Li, et al, Validation of an algorithm to estimate gestational age in electronic health plan databases. Pharmacoepidemiol Drug Saf, 2013.

Results

Describing the Cohort

	Linked	Not Linked
Number of pregnant patients	**1,949,278**	**469,648**
Number of deliveries	**2,320,805**	**504,785**
Maternal age at delivery date, years, mean (SD)	31.1 (4.7)	27.7 (7)
Maternal age at delivery date, years, N (%)		
10-19	74,628 (3.2)	57,151 (11.3)
20-24	228,917 (9.9)	159,735 (31.6)
25-29	620,428 (26.7)	114,115 (22.6)
30-34	860,169 (37.1)	97,280 (19.3)
35-39	440,767 (19.0)	50,537 (10.0)
40-44	89,898 (3.9)	15,625 (3.1)
45-54	5,998 (0.3)	10,342 (2.0)

	Linked	Not Linked
Race		
American Indian or Alaska Native	1,210 (0.1)	398 (0.1)
Asian	19,571 (1.0)	2,088 (0.4)
Black or African American	54,564 (2.8)	13,171 (2.8)
Native Hawaiian or Other Pacific Islander	989 (0.1)	224 (0.0)
White	196,037 (10.1)	35,273 (7.5)
Unknown	1,676,907 (86.0)	418,494 (89.1)
Hispanic		
Yes	24,897 (1.3)	6,968 (1.5)
No	139,800 (7.2)	26,866 (5.7)
Unknown	1,784,581 (91.6)	435,814 (92.8)

Pregnancy Conditions

	Linked	Not Linked
Total number of deliveries	**2,320,805**	**504,785**
Preterm	132,300 (5.7)	36,974 (7.3)
Cesarean delivery, inpatient	773,195 (33.3)	142,575 (28.2)
Gestational diabetes	159,193 (6.9)	25,831 (5.1)
Gestational hypertension	89,769 (3.9)	20,750 (4.1)
Pre-eclampsia/eclampsia, inpatient	103,725 (4.5)	27,490 (5.4)
History of preterm delivery	58,679 (2.5)	9,517 (1.9)
History of pregnancy (any outcome below)	849,785 (36.6)	128,666 (25.5)
History of live born delivery, inpatient	651,983 (28.1)	95,552 (18.9)
History of stillbirth, inpatient	11,356 (0.5)	2,060 (0.4)
History of miscarriage	317,992 (13.7)	48,346 (9.6)

# Maternal Conditions Among Linked and not Linked Deliveries

Condition	Linked	Not Linked
Pain conditions	3.5%	3.1%
Depression	5.2%	6.3%
Anxiety disorders	5.2%	6.4%
Epilepsy/convulsions	0.3%	0.4%
Obesity	3.9%	5.1%
Drug abuse	0.4%	1.2%
Tobacco use	3.0%	5.4%
Alcohol abuse	0.2%	0.5%

Condition	Linked	Not Linked
Asthma	2.8%	3.5%
Hypertension	2.5%	3.0%
Hyperlipidemia	2.1%	2.0%
Diabetes (type 1 or type 2)	1.3%	1.5%
Acquired Hypothyroidism	5.0%	3.1%
Anemia	3.0%	3.0%
Breast cancer	0.1%	0.1%
Melanoma	0.1%	0.1%

■ Linked ■ Not Linked
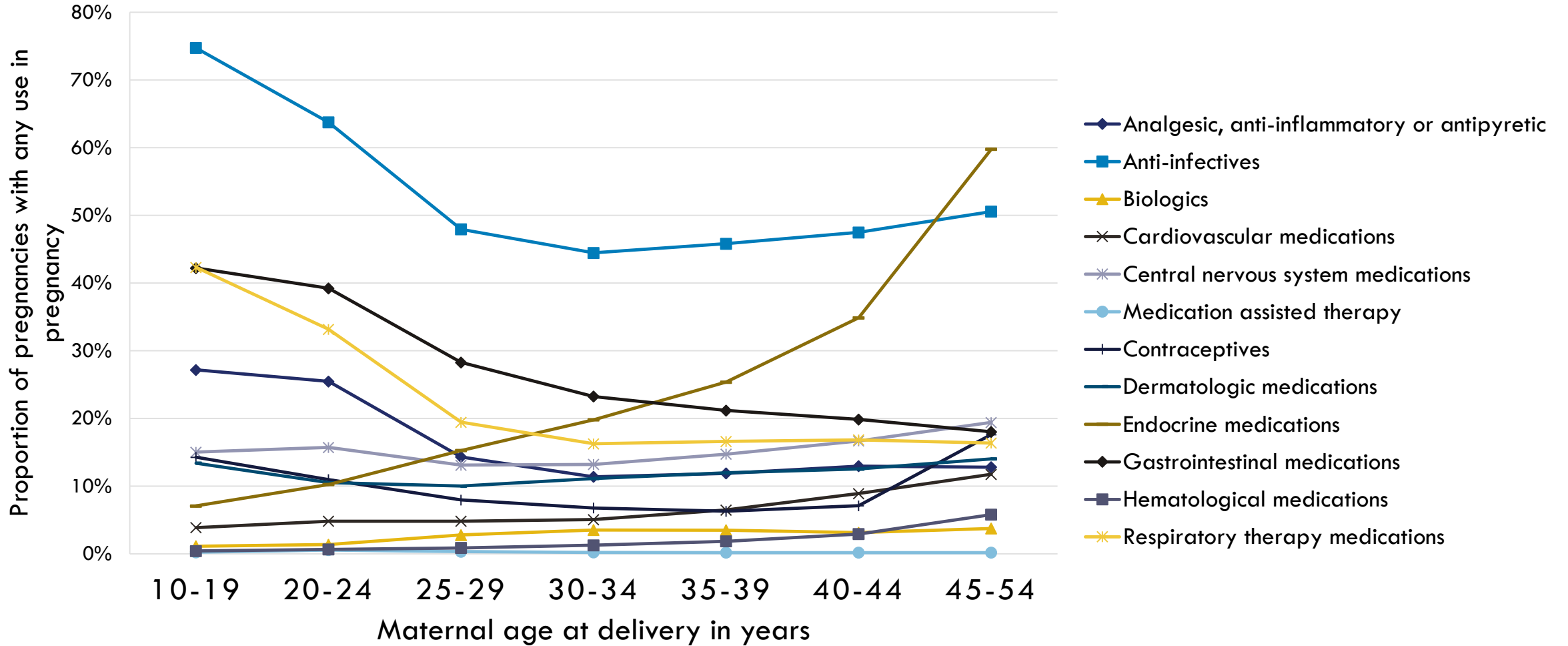
Maternal Medication use in Pregnancy, Linked vs not Linked
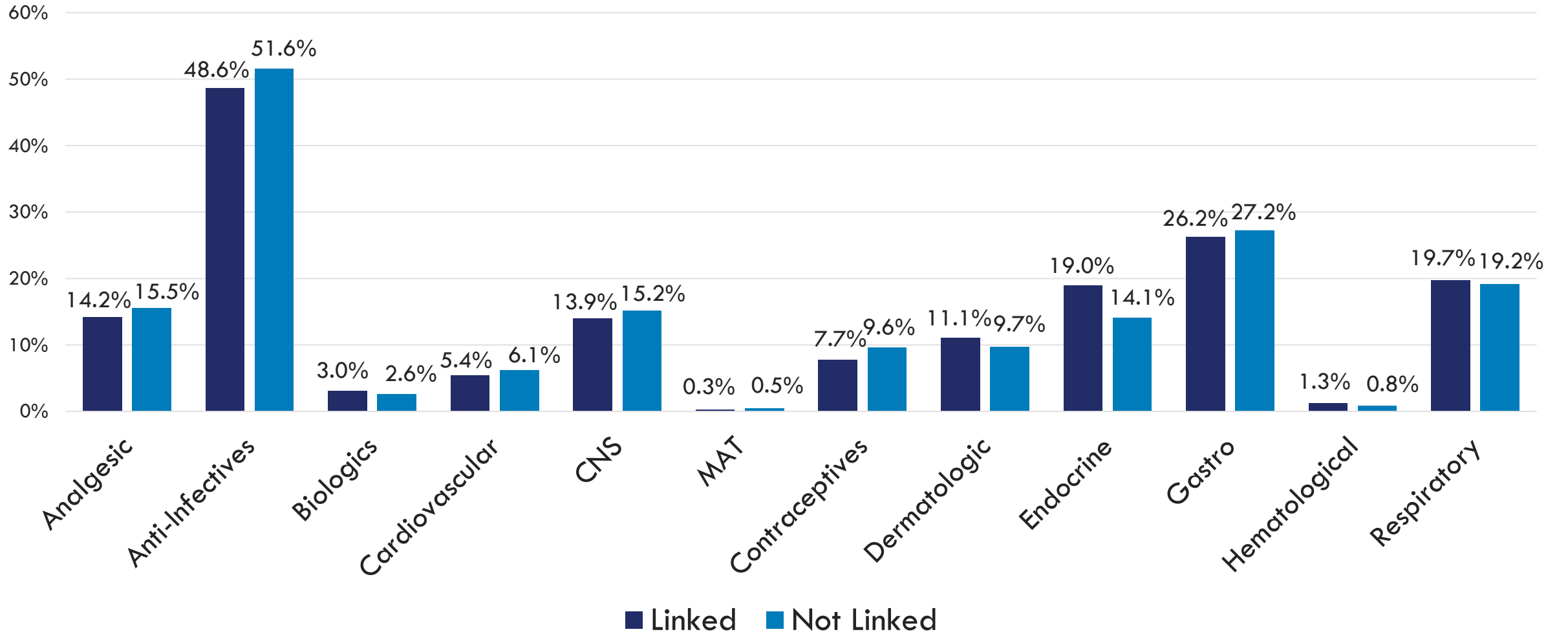
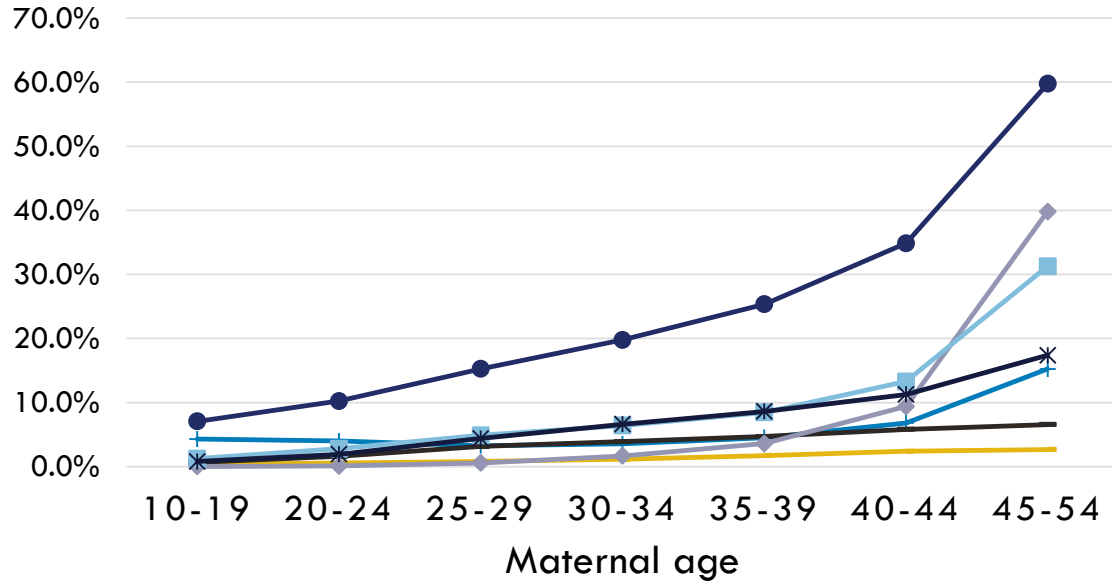1st, 2nd, or 3rd trimester use

Medication use by Trimester (Linked)
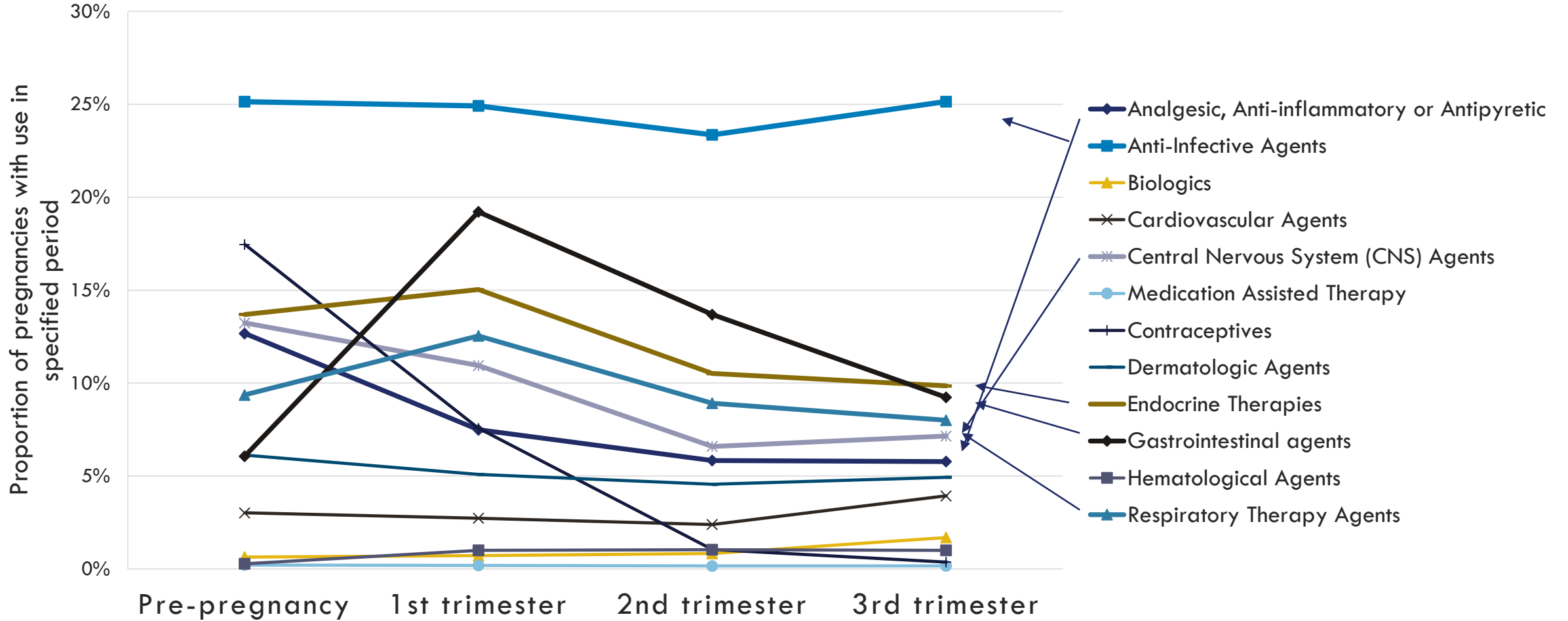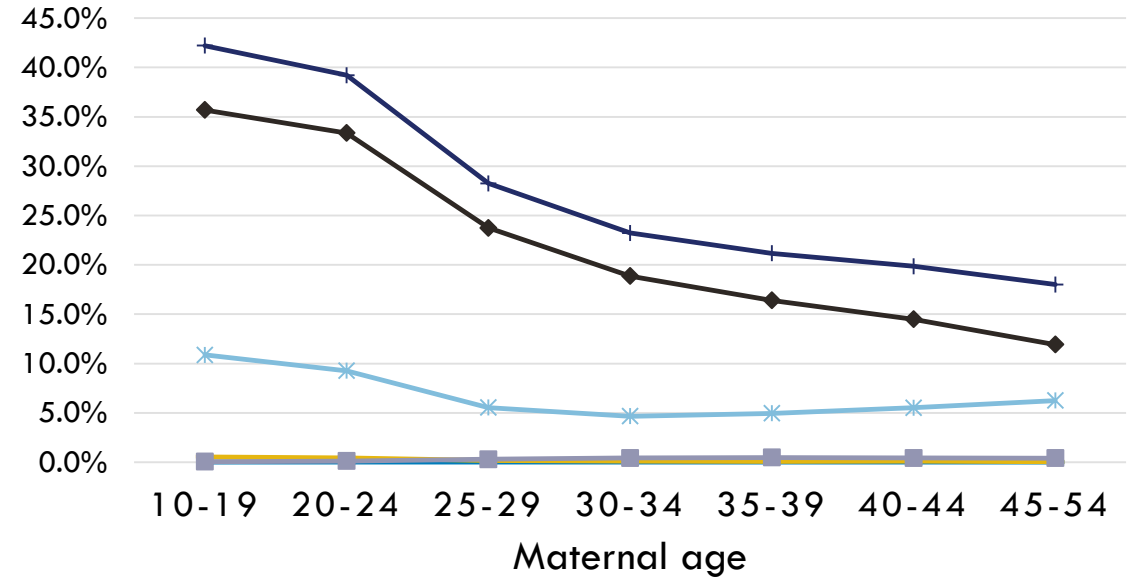
Medication use in Pregnancy by Maternal Age (Linked)

Select Medication Trends by age (Linked)

Endocrine medications by age

Legend:
- All endocrine medications
- Corticosteroids
- Injectable antidiabetics
- Oral antidiabetics
- Estrogen
- Progestins
- Thyroid medications

X-axis: Maternal age (10-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-54)

Gastrointestinal medications by age

Legend:
- All gastrointestinal medications
- Antacid
- Antidiarrheals
- Antiemetics
- Inflammatory bowel treatments
- Peptic ulcer medications

X-axis: Maternal age (10-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-54)

Conclusions

Strengths and Limitations

- At the time of this study, the Sentinel Mother-Infant Linkage table included more than 2.3 million linked deliveries that are available for monitoring of medication safety during pregnancy
  - This number is limited to deliveries that met specific enrollment criteria, therefore the cohort would be larger if less stringent enrollment criteria is required (i.e., 90 days prior to delivery through delivery)
- There are well-known limitations of using administrative claims data:
  - Incomplete capture of race and ethnicity and some lifestyle factors
  - Potential for medication exposure misclassification due to using dispensing records that may not reflect consumption
- We capture only live births, not pregnancies ending in miscarriage, termination, or stillbirth
- Analysis was limited to singletons, but multiple gestation pregnancies are captured for future analysis
- We did not collect information on why linkage was not possible for the not linked deliveries, but it could be related to:
  - Mother and infant enrolled under different plans
  - Misclassification of delivery status

Conclusions

- The Sentinel Mother-Infant Linkage table is a valuable resource for medication monitoring during pregnancy
  - Includes privately and publicly insured women and children from major insurers across the US
  - Includes very large sample sizes that can be used for monitoring of exposures to specific drugs
- When comparing health status of women with linked and not linked deliveries, we found few notable differences in health status, suggesting that maternal health status is not a strong selection factor for a linked cohort
  - Not linked mothers were younger and more likely to have a preterm birth, and many small differences in health status can reasonably be explained by differences in maternal age
- We observed some expected trends in maternal medication use, such as high use of antibacterials and antiemetics

Thank You

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