Oregon Medicaid Paid Births: Validity and Reliability of Birth Certificate Reported Payer and Medicaid Claims Data 2008-2014

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Abstract Self-reported payer data from the birth certificate is frequently used to identify Medicaid births, but evaluation of validity and reliability is lacking due to the challenges of gaining access to Medicaid data and data complexity. Oregon birth certificate and Medicaid paid claims were linked and compared to assess the validity and reliability of birth certificate reported payer data. Birth certificate data underestimated Medicaid paid births and underestimation grew from 18% in 2008 to 25% by 2014. Birth certificate data had moderate to substantial agreement with Medicaid claims, but reliability declined over time from a Kappa score of .82 to .75. Reliability was substantially lower for younger, less educated, Hispanic, American Indian or Alaskan Native (AIAN), Black or African American (BAA), and Native Hawaiian or Pacific Islander (NHPI) women. Specificity and positive predictive value were above 90% over time and by age, ethnicity, race and education. Sensitivity and negative predictive values declined from 84% and 87% in 2008 to 78% in 2014 and were lower than specificity and positive predictive values. Sensitivity values were higher for younger, less educated, Hispanic, AIAN, BAA and NHPI women. Negative predictive values were lower for younger, less educated, Hispanic, AIAN, BAA and NHPI women. The results document the limitations of birth certificate and strengths of Medicaid data for counting Medicaid paid births and allocating resources for community programs.

Keywords: birth certificate payer, medicaid births, medicaid paid claims, validity, reliability

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1. Introduction

Medicaid is a federal and state partnership program and a critical public payer for medical services for children, disabled, elderly, pregnant and low income populations. Medicaid enrollment grew significantly with the adoption of the Affordable Care Act and expansion to able bodied adults who were not previously eligible [1]. Medicaid pays for 44-48% of all births in the nation [2,3]. The lower estimate is based on hospital discharge data and is likely an underestimate because it is limited to 48 states, does not include birthing centers and home births, and is hospital-reported at discharge and not actual payer data. The higher estimate is based primarily on birth certificate data and like hospital discharge data likely underestimates Medicaid paid births because it is self-reported at the time of birth and not actual payer data. Actual payment source was not validated for either of the estimates.

While many studies document the validity and reliability of birth certificate reported demographics and maternal risk factors [4-9], only one recent study linked Medicaid claims and birth certificate data to assess the validity and reliability of reported and actual payer [10]. Kane and Sappenfield reported substantial agreement (Kappa .78), sensitivity (86%), specificity (92%), positive predictive value (87%) and negative predictive value (91%) between Medicaid and birth certificate data. Agreement was significantly lower among racial and ethnic minorities, women younger than 24, and less educated women [10].

Kane and Sappenfield's study underestimated Medicaid paid births because it limited Medicaid paid birth claims to those identified by Diagnosis Related Group codes (DRG) and because it excluded births identified in Medicaid claims that were not linked to a birth certificate and mothers with missing race, ethnicity, age or education data. The problem with limiting identification of Medicaid paid births to DRG codes is that smaller hospitals, birthing centers and other providers submit diagnostic and procedure codes and not DRG codes. Medicaid paid births that don't link to a birth certificate and birth certificates that link to Medicaid paid claims, but lack race, ethnicity,

age or education data are valid Medicaid paid births and excluding these undercounts Medicaid paid births. The study excluded 10-13% of valid Medicaid paid births and it is unknown how the exclusions alone or in combination affected validity and reliability measures.

Accurate measurement of Medicaid paid births is fundamental. Accurate Medicaid paid birth data benefits researchers, policy makers and the public. Inaccurate data impacts the ability to assess the relationship between Medicaid coverage and access to care, health outcomes and disparities. Underestimation of Medicaid paid births may mask true differences and impact the allocation of resources and services and can undermine public confidence.

The study purpose was to link Oregon Medicaid paid births from claims data with birth certificate data and assess validity and reliability. The study replicates the previous study and expands methods to address potential underestimation and provide an accurate count of Oregon Medicaid paid births.

2. Materials and Methods

The study examined births between 2008 and 2014. Data sources included Medicaid paid claims and birth certificate data.

Medicaid paid births were identified from final Medicaid paid claims by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes, Diagnosis Related Group (DRG) codes and Current Procedural Terminology (CPT) procedure codes. Codes used to identify Medicaid paid births include: diagnosis codes 640-679 (limited to fifth digit 1 or 2 and excluding 656.4 to 656.44 and 646.3 to 646.34), V27-V39; DRG codes 272-277, 765-775 and 789-795; and CPT codes 01960-01968, 59414-59614, 99436, T5905-T5959. Recipient identifier, case identifier, names, date of birth, race and ethnicity information for mother and newborn were obtained for analysis.

Births with Medicaid reported as payer were identified from birth certificate data. The Oregon Center for Health Statistics conducts regular on-going quality assurance that includes follow up with data reporters and data corrections. At or around labor and delivery, birth certifiers at hospitals and birth centers and providers collect mother's principal payment source and enter information into either the electronic Oregon Vital Events Registration System or submit a paper Certificate of Live Birth to the Oregon Center for Health Statistics. Principal payment source options include: Medicaid/OHP/CAWEM, private insurance, self-pay, Indian Health Services, CHAMPUS/Tricare, other government source, other and unknown. Other and other government source are text data entry fields and the remaining options are reported by selecting the type from a drop down menu in the electronic version or check boxes on the paper form. We reviewed text fields to identify Medicaid payers by name and reclassified 1,630 births as Medicaid paid. After reclassification, birth certificates were coded as Medicaid paid and not Medicaid paid for analysis. Names and date of birth for parents and newborn and mother's age, education, race and ethnicity were obtained for analysis.

3. Analysis

Link Plus 2.0 was used to link birth certificate and Medicaid paid birth claims from 2008 to 2014 based on child and parent last names, first names, and dates of birth. The linkage was performed in a stepwise process starting with exact or nearly exact matches, then probabilistic matches and followed by manual matches. Annually, we were unable to match 1-2% of Medicaid paid births identified from claims and 1-2% of birth certificates with Medicaid reported as the payer.

Validity and reliability statistics included Kappa, sensitivity, specificity, positive predictive value and negative predictive value. Medicaid paid claims were considered the gold standard for identification of Medicaid paid births. Sensitivity measures the number of true positives or the proportion of Medicaid paid births correctly identified from both birth certificate and Medicaid claims data. Specificity measures the number of true negatives or the proportion of not Medicaid paid births correctly identified from birth certificate data and not found in Medicaid claims data. Positive predictive value is the probability that birth certificates with reported Medicaid payer are truly Medicaid paid births. Negative predictive value is the probability that birth certificates with reported payer not Medicaid are truly not Medicaid paid births.

We evaluated reliability and validity overall and by selected maternal characteristics including age, race, ethnicity, and education. Medicaid recipient data was used to identify age, race and ethnicity when Medicaid paid births did not link to a birth certificate. American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), and Native Hawaiian or Pacific Islander (NHPI) race groups included mothers who reported race alone or in combination with another race and without regard to ethnicity. The Hispanic ethnic group included all mothers who reported Hispanic ethnicity regardless of race. Race and ethnic groups are not mutually exclusive except for the referent White Alone Not Hispanic group. This approach supports comparison of minority race and Hispanic groups with the referent group.

4. Results

A total of 324,639 births were identified from Medicaid paid claims and birth certificate data with an average of 46,377 births annually from 2008-2014 (Table 1). A total of 141,434 birth certificates indicated that Medicaid was the payer with an average of 20,205 births annually. A total of 169,697 Medicaid paid births were identified in Medicaid claims with an average of 24,242 births annually. Birth certificate reported Medicaid payer data indicated that Medicaid was the payer for 41% to 44% of births compared to 48% to 56% of births based on Medicaid paid claims data (Table 2).

Oregon births declined 9% from 2008 to 2014. The annual growth pattern from 2008-14 was markedly different between birth certificate and Medicaid claims data (Table 3). Birth certificate reported Medicaid payer declined four of the years from .5% to 2.3% and increased by .4% and 2.4% in 2010 and 2014. In contrast, Medicaid paid births from claims increased every year from .05% to 4.5%.

Table 1. Oregon Births, Payer & Demographics 2008-2014

	Total Oregon Resident Births*								Birth Certificate Reported Medicaid Payer							
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
Total	49,605	47,569	46,011	45,491	45,310	45,444	45,209	324,639	20,462	20,360	20,450	20,431	20,065	19,600	20,066	141,434
Age																
<20	9%	9%	8%	7%	6%	6%	5%	7%	16%	15%	13%	12%	11%	10%	9%	12%
20-24	24%	23%	23%	22%	22%	21%	20%	22%	36%	35%	34%	33%	32%	31%	30%	33%
25-29	29%	29%	29%	29%	29%	29%	29%	29%	26%	27%	28%	28%	29%	30%	30%	28%
30-34	23%	24%	25%	26%	27%	28%	28%	26%	14%	15%	16%	18%	18%	19%	20%	17%
35-39	12%	12%	12%	13%	13%	13%	14%	13%	6%	6%	7%	8%	8%	8%	9%	8%
40+	2%	3%	3%	3%	3%	3%	3%	3%	1%	1%	2%	2%	2%	2%	2%	2%
Unknown	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	1.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ethnicity																
Hispanic	21%	21%	20%	19%	19%	19%	19%	20%	35%	33%	33%	32%	31%	30%	30%	32%
Not Hispanic	79%	79%	79%	80%	81%	81%	81%	80%	65%	67%	67%	68%	69%	69%	70%	68%
Unknown	0.0%	0.3%	0.3%	0.5%	0.5%	0.4%	0.4%	0.3%	0.0%	0.2%	0.3%	0.4%	0.4%	0.4%	0.4%	0.3%
Race**																
AIAN	3%	3%	3%	3%	3%	3%	4%	3%	4%	4%	5%	5%	5%	5%	6%	5%
Asian	5%	5%	6%	6%	6%	6%	6%	6%	3%	3%	3%	3%	3%	3%	4%	3%
Black	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	4%	4%	4%	4%	4%
NHPI	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%	2%	1%	2%	1%
White Alone	67%	67%	67%	68%	68%	68%	67%	68%	53%	55%	54%	55%	56%	56%	56%	55%
Multi Race	3%	3%	4%	4%	4%	4%	5%	4%	4%	4%	5%	5%	5%	5%	6%	5%
Unknown	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	1%	1%
Education																
Less than High school	21%	19%	19%	17%	16%	15%	14%	17%	39%	36%	34%	31%	30%	29%	27%	32%
High school	24%	24%	23%	23%	22%	22%	22%	23%	33%	34%	32%	33%	32%	32%	32%	33%
More than High school	53%	55%	57%	59%	61%	62%	62%	58%	27%	30%	33%	36%	37%	38%	40%	34%
Unknown	2%	1%	1%	1%	1%	1%	2%	1%	1%	1%	0%	0%	1%	1%	1%	1%

	Medicaid Paid Claims															
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**								
Total	23,642	23,653	24,163	24,237	24,289	24,309	25,404	169,697								
Age																
<20	16%	15%	13%	12%	11%	10%	9%	12%								
20-24	36%	34%	33%	32%	32%	31%	29%	33%								
25-29	26%	27%	28%	28%	29%	29%	30%	28%								
30-34	14%	15%	16%	18%	18%	19%	20%	17%								
35-39	6%	6%	7%	8%	8%	8%	9%	8%								
40+	1%	1%	2%	2%	2%	2%	2%	2%								
Unknown	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	1.8%	0.4%								
Ethnicity																
Hispanic	34%	33%	31%	30%	29%	28%	27%	30%								
Not Hispanic	66%	67%	68%	70%	71%	71%	72%	69%								
Unknown	0.0%	0.2%	0.3%	0.4%	0.5%	0.5%	0.4%	0.3%								
Race**																
AIAN	4%	4%	5%	4%	4%	5%	5%	5%								
Asian	3%	3%	3%	3%	4%	3%	4%	3%								
Black	4%	4%	4%	4%	4%	4%	4%	4%								
NHPI	1%	1%	1%	1%	1%	1%	2%	1%								
White Alone	55%	56%	56%	58%	59%	59%	59%	57%								
Multi Race	4%	4%	5%	4%	5%	4%	6%	5%								
Unknown	1%	1%	2%	2%	2%	2%	2%	2%								
Education																
Less than High school	37%	34%	32%	29%	27%	26%	24%	30%								
High school	33%	33%	32%	32%	32%	31%	31%	32%								
More than High school	27%	30%	34%	37%	40%	41%	43%	36%								
Unknown	3%	2%	2%	2%	2%	2%	2%	2%								

*Oregon resident births and Medicaid paid births from claims. Out-of-state resident birth data not available for 2014 (n=873).

** American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), Native Hawaiian or Pacific Islander (NHPI) race alone or in combination without regard to ethnicity. White alone and Not Hispanic.

Table 2. Percent of Age Group, Race, Ethnicity and Education by Birth Certificate and Medicaid Claims

	Birth Certificate Reported Medicaid Payer								Medicaid Paid Claims							
	2008	2009	2010	2011	2012	2013	2014	Total	2008	2009	2010	2011	2012	2013	2014	Total
Total	41%	43%	44%	45%	44%	43%	44%	44%	48%	50%	53%	53%	54%	53%	56%	52%
Age																
<20	73%	74%	76%	75%	75%	74%	76%	75%	84%	87%	90%	90%	91%	91%	92%	89%
20-24	60%	64%	67%	67%	66%	64%	66%	65%	69%	74%	77%	79%	80%	80%	82%	77%
25-29	38%	40%	43%	43%	44%	44%	47%	43%	43%	46%	50%	51%	53%	54%	58%	51%
30-34	25%	27%	28%	30%	30%	29%	31%	29%	29%	31%	34%	36%	36%	36%	39%	34%
35-39	21%	23%	26%	28%	28%	27%	29%	26%	25%	27%	31%	32%	33%	34%	37%	31%
40+	23%	23%	25%	30%	29%	31%	32%	28%	28%	28%	31%	35%	35%	38%	41%	34%
Unknown	2%	0%	0%	0%	0%	0%	0%	0%	94%	93%	100%	98%	100%	88%	100%	98%
Ethnicity																
Hispanic	68%	69%	72%	73%	72%	70%	70%	71%	77%	79%	82%	82%	82%	80%	83%	81%
Not Hispanic	34%	36%	38%	38%	38%	37%	38%	37%	40%	42%	45%	46%	47%	47%	50%	45%
Unknown	15%	39%	41%	33%	39%	42%	40%	39%	31%	44%	50%	44%	51%	60%	55%	51%
Race*																
AIAN	57%	59%	63%	65%	63%	61%	63%	62%	66%	69%	72%	75%	74%	76%	77%	73%
Asian	20%	21%	24%	25%	25%	25%	27%	24%	24%	25%	30%	31%	32%	32%	36%	30%
Black	62%	64%	65%	65%	64%	62%	62%	63%	70%	74%	75%	76%	76%	75%	76%	75%
NHPI	54%	58%	60%	62%	61%	61%	62%	60%	64%	65%	70%	70%	73%	72%	77%	70%
White Alone	32%	35%	36%	36%	36%	35%	37%	35%	39%	41%	44%	45%	46%	46%	49%	44%
Multi Race	52%	54%	55%	56%	53%	50%	55%	54%	58%	61%	62%	63%	65%	62%	67%	63%
Unknown	41%	51%	47%	51%	56%	52%	46%	50%	74%	77%	76%	73%	79%	76%	81%	77%
Education																
Less than HS	76%	79%	81%	83%	83%	82%	84%	81%	85%	88%	91%	91%	92%	92%	94%	90%
High school (HS)	56%	60%	63%	64%	64%	63%	66%	62%	64%	69%	72%	74%	76%	76%	79%	72%
More than HS	21%	23%	26%	27%	27%	27%	28%	26%	25%	27%	31%	34%	35%	35%	39%	32%
Unknown	17%	18%	14%	14%	21%	22%	17%	17%	83%	81%	85%	79%	80%	82%	86%	83%

*American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), Native Hawaiian or Pacific Islander (NHPI) race alone or in combination without regard to ethnicity. White alone and Not Hispanic.

Table 3. Oregon Medicaid Paid Births Growth Pattern 2008-2014

	Total Oregon Resident Growth						Birth Certificate Growth						Medicaid Paid Claims Growth					
	2009	2010	2011	2012	2013	2014	2009	2010	2011	2012	2013	2014	2009	2010	2011	2012	2013	2014
Total	-4.1%	-3.3%	-1.1%	-0.4%	0.3%	-0.5%	-0.5%	0.4%	-0.1%	-1.8%	-2.3%	2.4%	0.05%	2.2%	0.3%	0.2%	0.1%	4.5%
Age																		
<20	-9.1%	-13.7%	-10.8%	-9.1%	-9.7%	-10.3%	-7.6%	-11.8%	-11.6%	-9.9%	-10.5%	-7.9%	-6.2%	-10.2%	-11.4%	-8.2%	-9.2%	-9.1%
20-24	-9.4%	-5.0%	-4.6%	-2.0%	-1.8%	-5.4%	-4.3%	-1.0%	-3.9%	-3.8%	-4.8%	-2.0%	-4.0%	0.0%	-2.7%	-0.3%	-2.6%	-2.4%
25-29	-3.2%	-3.1%	-1.2%	-2.0%	0.1%	-1.0%	2.3%	4.0%	0.1%	0.4%	0.2%	4.1%	2.9%	5.3%	1.0%	1.9%	1.9%	5.8%
30-34	0.6%	-0.5%	3.4%	2.3%	4.2%	0.7%	7.9%	4.3%	11.0%	0.4%	1.8%	7.9%	8.7%	7.6%	10.8%	0.8%	5.9%	7.9%
35-39	-2.3%	0.2%	1.9%	4.6%	1.1%	2.5%	8.8%	10.2%	10.1%	5.4%	-2.3%	12.2%	7.5%	13.8%	6.8%	7.1%	2.0%	11.8%
40 or older	5.5%	4.2%	1.5%	4.3%	0.2%	2.3%	3.6%	14.9%	18.7%	0.8%	8.6%	4.2%	8.0%	14.5%	14.9%	5.2%	7.6%	12.0%
Unknown	-17%	-7%	0%	-34%	-4%	1615%	-100%						-18%	0%	-2%	-33%	-15%	1835%
Ethnicity																		
Hispanic	-6.5%	-4.7%	-5.7%	-2.5%	-0.6%	-0.5%	-4.8%	-1.3%	-3.3%	-4.2%	-4.1%	0.7%	-4.3%	-1.3%	-5.2%	-2.4%	-2.8%	2.1%
Not Hispanic	-3.8%	-3.0%	-0.1%	0.1%	0.6%	-0.5%	1.4%	1.2%	1.4%	-0.8%	-1.5%	3.2%	1.9%	3.7%	2.8%	1.2%	1.2%	5.6%
Unknown	885%	26%	35%	2%	-12%	-9%	2400%	32%	11%	19%	-6%	-12%	1300%	45%	17%	20%	4%	-18%
Race*																		
AIAN	-5.5%	6.7%	-4.5%	-0.4%	1.9%	20.1%	-1.9%	13.3%	-0.7%	-4.6%	-0.8%	23.5%	-0.9%	11.0%	-1.3%	-1.6%	4.3%	22.6%
Asian	0.4%	-0.2%	1.0%	3.2%	-1.0%	3.4%	4.9%	11.4%	7.8%	2.0%	-2.8%	12.7%	7.9%	17.5%	4.5%	7.3%	-2.3%	16.0%
Black	-5.3%	2.5%	1.8%	2.5%	0.3%	3.3%	-1.5%	3.3%	2.1%	0.7%	-2.0%	3.3%	-0.2%	4.7%	2.6%	3.2%	-1.0%	4.5%
NHPI	-4.6%	13.9%	-9.9%	6.7%	-6.9%	7.6%	3.5%	18.2%	-8.0%	5.2%	-6.3%	9.5%	-3.0%	22.7%	-10.2%	12.0%	-8.5%	14.7%
White	-3.3%	-4.0%	0.1%	0.0%	0.6%	-1.7%	3.1%	-0.4%	1.5%	-0.3%	-1.9%	2.5%	2.4%	2.5%	3.2%	1.4%	1.1%	3.9%
Multiple	1.4%	14.1%	-2.7%	6.9%	-3.3%	29.0%	5.1%	17.1%	-1.5%	1.6%	-8.4%	39.5%	6.9%	16.5%	-1.7%	10.5%	-7.5%	39.7%
Unknown	-8.5%	19%	9%	8%	11%	-23%	13%	9%	19%	20%	2%	-32%	-4%	17%	5%	16%	7%	-18%
Education																		
< High school	-10.4%	-7.3%	-11.2%	-5.8%	-4.7%	-5.9%	-7.7%	-4.6%	-9.0%	-6.1%	-5.2%	-3.8%	-7.7%	-4.2%	-10.7%	-5.1%	-4.3%	-4.2%
High school	-6.3%	-7.2%	-0.8%	-3.5%	-0.6%	-1.2%	-0.1%	-3.1%	1.4%	-3.2%	-3.0%	3.3%	1.6%	-2.7%	1.5%	-0.7%	-1.2%	2.7%
> High school	-0.1%	-0.2%	2.2%	2.6%	1.7%	0.6%	9.5%	10.9%	7.8%	2.9%	0.3%	6.4%	10.8%	14.4%	10.5%	5.7%	3.4%	10.3%
Unknown	-19.6%	-1%	-8%	-13%	14%	21%	-12%	-21%	-10%	33%	18%	-10%	-22%	5%	-14%	-13%	18%	27%

*American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), Native Hawaiian or Pacific Islander (NHPI) race alone or in combination without regard to ethnicity. White alone and Not Hispanic.

Mother's age and ethnicity were similar for birth certificate and Medicaid paid claims births, but varied by race. Births to mothers younger than 25 declined over time, but increased for mothers over the age of 24 in both data sources. In both data sources, births to Hispanic mothers declined over time except for 2014 and increased for Not Hispanic mothers except in 2012-13 birth certificate data. Births to Asian mothers grew most years in both data sources. Births to White Alone Not Hispanic mothers grew every year in Medicaid claims and half the years in birth certificate data. The growth pattern for births to AIAN, BAA and NHPI mothers varied by year and data source.

Reliability measured by the Kappa statistic indicated moderate to substantial agreement between birth certificate and Medicaid paid claims that declined over time from a high of .824 to a low of .747 (Table 4). The Kappa statistic tended to increase with age and decrease within age groups over time. The Kappa statistic was lowest for women less than 20 years old and ranged from a high of .589 to a low of .381. The Kappa statistic was highest for women 30-34 years old and ranged from .853 to .801.

Kappa was lower for Hispanic women and ranged from .708 to .652 compared to .83 to .744 for Not Hispanic women. Kappa statistics were lowest for AIAN, BAA and NHPI women. Over time Kappa decreased from .742 to .647 for AIAN women; decreased from .741 to .649 for BAA women; and decreased from .764 to .657 for NHPI. Kappa indicated substantial agreement for Asian and White Alone Not Hispanic women.

Table 4. Birth Certificate and Medicaid Claims Reliability of Reported and Actual Payer

	Kappa Coefficient						
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Total	.824	.833	.810	.806	.790	.767	.747
Age							
<20	.589	.573	.451	.456	.422	.386	.381
20-24	.744	.745	.691	.672	.612	.586	.567
25-29	.838	.842	.823	.813	.794	.773	.757
30-34	.853	.862	.839	.839	.838	.807	.801
35-39	.832	.856	.838	.848	.842	.809	.824
40+	.836	.841	.822	.842	.823	.825	.781
Ethnicity							
Hispanic	.708	.710	.698	.721	.691	.685	.652
Not Hispanic	.830	.842	.812	.802	.787	.763	.744
Race*							
AIAN	.742	.751	.754	.749	.721	.647	.647
Asian	.853	.868	.827	.844	.791	.801	.787
Black	.741	.751	.726	.719	.801	.667	.649
NHPI	.764	.800	.746	.725	.704	.702	.657
White Alone	.857	.858	.830	.815	.801	.777	.758
Multi Race	.831	.813	.819	.826	.742	.735	.714
Education							
<High School	.644	.638	.578	.595	.554	.531	.488
High School	.791	.778	.743	.736	.688	.668	.656
>High School	.847	.856	.828	.811	.794	.767	.744

*American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), Native Hawaiian or Pacific Islander (NHPI) race alone or in combination without regard to ethnicity. White alone and Not Hispanic.

Table 5. Birth Certificate and Medicaid Claims Validity of Reported and Actual Payer

	Validity Measures													
	Sensitivity							Specificity						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
Total	84%	85%	83%	83%	81%	79%	78%	98%	99%	98%	99%	99%	98%	99%
Age														
<20	85%	85%	83%	83%	82%	80%	82%	91%	96%	92%	91%	93%	92%	94%
20-24	85%	86%	85%	84%	81%	79%	80%	95%	97%	96%	97%	97%	97%	97%
25-29	84%	85%	84%	83%	82%	80%	80%	98%	99%	99%	99%	98%	98%	99%
30-34	83%	84%	82%	82%	82%	78%	78%	99%	99%	99%	99%	99%	99%	99%
35-39	80%	83%	81%	83%	82%	78%	79%	99%	99%	99%	99%	99%	99%	99%
40+	81%	80%	79%	83%	80%	81%	76%	98%	99%	99%	99%	99%	99%	100%
Ethnic														
Hispanic	86%	87%	87%	89%	87%	86%	85%	94%	96%	98%	97%	97%	97%	98%
Not Hispanic	83%	84%	81%	81%	79%	77%	75%	98%	99%	99%	99%	99%	99%	99%
Race*														
AIAN	84%	84%	86%	87%	84%	80%	81%	95%	98%	97%	97%	98%	98%	98%
Asian	82%	83%	78%	81%	76%	76%	75%	99%	100%	99%	99%	99%	99%	100%
Black	86%	86%	85%	85%	83%	82%	81%	94%	98%	98%	98%	99%	97%	97%
NHPI	83%	87%	85%	85%	82%	83%	81%	98%	96%	97%	93%	98%	95%	99%
White	83%	84%	81%	80%	79%	76%	75%	100%	100%	100%	100%	100%	100%	100%
Multi	88%	87%	87%	88%	81%	80%	80%	97%	97%	98%	98%	99%	98%	99%
Education														
<High School	88%	89%	89%	91%	90%	89%	89%	91%	94%	95%	93%	92%	93%	94%
High School	86%	86%	86%	86%	84%	82%	83%	96%	98%	97%	97%	97%	97%	97%
>High School	82%	82%	80%	78%	76%	74%	72%	99%	99%	99%	99%	99%	99%	99%

	Validity Measures													
	Positive Predictive Value							Negative Predictive Value						
	2008	2009	2010	2011	2012	2013	2014	2008	2009	2010	2011	2012	2013	2014
Total	97%	98%	98%	98%	99%	98%	99%	87%	87%	84%	84%	82%	81%	78%
Age														
<20	98%	99%	99%	99%	99%	99%	99%	53%	49%	37%	38%	34%	31%	30%
20-24	98%	99%	99%	99%	99%	99%	99%	74%	71%	65%	62%	56%	54%	51%
25-29	97%	98%	98%	98%	98%	98%	99%	89%	88%	86%	85%	83%	81%	78%
30-34	96%	97%	98%	98%	98%	98%	98%	94%	93%	91%	91%	91%	89%	88%
35-39	95%	97%	98%	97%	98%	97%	99%	94%	94%	92%	92%	92%	90%	89%
40+	95%	98%	97%	97%	98%	98%	99%	93%	93%	91%	91%	90%	89%	85%
Ethnic														
Hispanic	98%	99%	99%	99%	99%	99%	100%	67%	66%	63%	65%	62%	62%	58%
Not Hispanic	97%	98%	98%	98%	98%	98%	99%	90%	89%	87%	85%	84%	83%	80%
Race*														
AIAN	97%	99%	99%	99%	99%	99%	99%	75%	73%	73%	71%	69%	61%	60%
Asian	95%	98%	98%	98%	97%	98%	99%	95%	94%	92%	92%	90%	90%	88%
Black	97%	99%	99%	99%	100%	99%	99%	74%	72%	68%	67%	64%	63%	61%
NHPI	99%	98%	98%	97%	99%	98%	100%	76%	80%	73%	73%	67%	69%	61%
White	100%	100%	100%	100%	100%	100%	100%	90%	90%	87%	86%	85%	83%	81%
Multi	98%	98%	98%	99%	99%	99%	99%	85%	82%	82%	83%	74%	75%	71%
Education														
<High School	98%	99%	99%	99%	99%	99%	100%	58%	55%	47%	49%	45%	42%	37%
High School	97%	99%	99%	99%	99%	99%	99%	80%	76%	72%	70%	65%	63%	60%
>High School	95%	97%	97%	98%	98%	97%	98%	94%	94%	92%	90%	89%	87%	85%

*American Indian or Alaskan Native (AIAN), Asian, Black or African American (BAA), Native Hawaiian or Pacific Islander (NHPI) race alone or in combination without regard to ethnicity. White alone and Not Hispanic.

Reliability increased with higher education and decreased within education groups over time. Women with less than a high school education had the lowest Kappa from .644 to .488. Women with a high school education had the next lowest Kappa from .791 to .656. Women with more than a high school education had the highest Kappa from .847 to .744.

Sensitivity, specificity, positive predictive value and negative predictive value measures of validity painted a mixed picture (Table 5). Specificity and positive predictive value were above 90% overall across years and by age, ethnicity, race and education. Sensitivity values were lower than specificity and positive predictive values and declined from 84% to 78% overall across years. Sensitivity was the lowest for women over the age of 39 years. Not Hispanic women had lower sensitivity scores from 83% to 75% compared to 86% to 85% for Hispanic women. AIAN, BAA, and NHPI women had higher sensitivity scores than White Alone Not Hispanic women. Sensitivity scores were the highest for the women with the lowest education, followed by high school graduates and women educated beyond high school.

Negative predictive values declined overall from 87% to 78%. Women under the age of 25 had the lowest scores and ranged from 74% to 30% compared to older women with scores from 94% to 78%. Negative predictive values for Hispanic women ranged from 67% to 58% and were much lower than Not Hispanic women with scores that ranged from 90% to 80%. Negative predictive values for AIAN, BAA and NHPI women ranged from 76% to 60% and were much lower than White Alone Not Hispanic women with scores from 95% to 88%. Negative predictive values were lowest for the least educated women and ranged from 58% to 37%. Negative predictive values ranged from 80% to 60% for women with a high school education and ranged from 94% to 85% for women with education beyond high school.

5. Discussion and Conclusions

Birth certificate data underestimates the number of Medicaid paid births and underestimation grew from 18% in 2008 to 25% by 2014. Reliability and validity were consistent with prior study results except sensitivity and negative predictive value were lower. The current and prior studies showed markedly lower reliability and validity for younger, less educated and Hispanic, AIAN, BAA, and NHPI women.

Underestimation was likely due in part to the lack of out-of-state birth certificate availability in 2014 and significant Medicaid expansion. Medicaid claims capture births in out-of-state facilities, but birth certificate data was limited in 2014 to births that occurred in Oregon. Medicaid enrollment more than doubled from 2008 with more than half of the growth observed from 2013 to 2014. The expansion likely contributed to increased reporting errors about payer source. Medicaid recipients, particularly new recipients, may incorrectly report payer as something

other than Medicaid. Medicaid recipients may confuse the name of their Medicaid coordinated care organization with a private insurance company or not recognize that it is Medicaid. Medicaid is commonly referred to as the Oregon Health Plan in Oregon and not as Medicaid.

An accurate count of Medicaid paid births matters because it influences policy decisions and the allocation of resources across Oregon for early learning, social, educational and health services. In Oregon the Title V Maternal Child Health Block Grant and Maternal Infant Early Childhood Home Visiting Programs funded by the US Health Resources and Services Administration rely on birth certificate data to estimate low income women and Medicaid paid births. The programs provide funding and support to local public health and community based agencies to provide services to low income pregnant women, children and families. Programs facilitate access to prenatal care, medical transportation, case management and care coordination. Reliance on the birth certificate data underestimates women enrolled in Medicaid and does not represent the true proportion of Medicaid paid births by age, race, ethnicity and education.

The study highlighted the limitations of birth certificate data for counting Medicaid paid births. Birth certificate data is frequently used to estimate Medicaid paid births, because it is readily available, published annually and does not require direct access to the data or technical programming skills to estimate Medicaid paid births.

Medicaid claims data is the best source for counting Medicaid paid births and allocating resources for community programs. Obtaining Medicaid claims data is challenging and analysis requires substantial statistical and programmatic experience. These barriers should not prevent the pursuit of accurate data that influences policy, resource allocation, and supports accurate evaluation of health outcomes and potential disparities.

Acknowledgements

Competing Interests

This project did not have any competing or conflicts of interest.

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