Objectives

- Application of insurance claims data
  - Private, employer-sponsored insurance
  - Medicaid
- Quantify health care use by children with sickle cell disease (SCD) and comorbid conditions
- Assess incremental expenditures for affected children with SCD relative to unaffected children
- Assess effects of plan type on expenditures
  - Fee-for-service
  - Capitated
Three Analyses Summarized


Data Source

- MarketScan® research databases
  - Created by Thomson Reuters Inc., a health benefits company, from paid claims
  - Commercial Claims and Encounters
    - 17 million employees and dependents
  - Multi-State Medicaid
    - Enrollees in state Medicaid programs, 8 blinded states

- Administrative data
  - No link to medical records
Case Ascertainment

- ICD-9 codes for SCD: 282.6x, 282.41, 282.42
  - 282.6x codes include Hb SS and compound heterozygotes with Hb S and another β-globin mutation
  - 282.41 and 282.42 codes capture Hb-S/β-thalassemia
- SCD ICD-9 code recorded for inpatient or outpatient claims between 2001 and 2005 for children born between 1988 and 2004
  - 1 inpatient or 2+ outpatient claims >30 days apart
  - Outpatient codes less reliable than inpatient codes

- 1988-2004 Births
  - With SCD
    - 3,154 Medicaid
    - 913 privately insured
  - Without SCD
    - 2,668,099 Medicaid
    - 4,375,993 privately insured
Administrative Prevalence of SCD

<table>
<thead>
<tr>
<th></th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full sample</strong></td>
<td>1:847</td>
<td>1:4,794</td>
</tr>
<tr>
<td><strong>Age Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–5 years</td>
<td>1:988</td>
<td>1:4,629</td>
</tr>
<tr>
<td>6–11 years</td>
<td>1:840</td>
<td>1:4,479</td>
</tr>
<tr>
<td>12–17 years</td>
<td>1:702</td>
<td>1:5,267</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1:408</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1:1,997</td>
<td></td>
</tr>
</tbody>
</table>

Health Care Utilization

- Types of health care
  - Inpatient hospital
  - Emergency department (ED)
  - Non-emergency outpatient
  - Medications
    - Prescription medications in Commercial database
    - All medications in Medicaid database
- Utilization examined per person with SCD and per person using care
Health Care Expenditures

- Sum of payments by health plans and family out-of-pocket costs (copays and deductibles)
  - No out-of-pocket costs for Medicaid
- For capitated managed care plans, payments imputed
- No data on charges, only payments

Sample for Health Care Analyses

- Restricted to individuals with 365 days of enrollment during 2005 with drug benefits
  - Excluded 22-23% of sample with SCD
  - Excluded 89 children with SCD in Commercial database without prescription drug coverage
  - Excluded 42-45% of sample without SCD
    - Children with SCD more likely to be continuously enrolled
- Final sample with SCD
  - 2,428 Medicaid enrollees
  - 621 privately insured
### Inpatient Admissions and Expenditures During 2005

<table>
<thead>
<tr>
<th></th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>% with admission</td>
<td>43%</td>
<td>38%*</td>
</tr>
<tr>
<td>Admissions per child with SCD</td>
<td>0.91</td>
<td>0.79**</td>
</tr>
<tr>
<td>Admissions per child with an admission</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Mean length of stay per admission (days)</td>
<td>3.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Mean expenditure per admission</td>
<td>$6,469</td>
<td>$10,013</td>
</tr>
<tr>
<td>Mean expenditure per child with SCD</td>
<td>$5,963</td>
<td>$7,820*</td>
</tr>
</tbody>
</table>

* p<0.05, **p<0.01

### Emergency Department Visits and Expenditures During 2005

<table>
<thead>
<tr>
<th></th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>% with ED visit</td>
<td>57%</td>
<td>45%**</td>
</tr>
<tr>
<td>ED visits per child with SCD</td>
<td>1.36</td>
<td>0.91**</td>
</tr>
<tr>
<td>Admissions per child with an admission</td>
<td>2.4</td>
<td>2.0**</td>
</tr>
<tr>
<td>Mean expenditure per admission</td>
<td>$371</td>
<td>$517</td>
</tr>
<tr>
<td>Mean expenditure per child with SCD</td>
<td>$506</td>
<td>$463</td>
</tr>
</tbody>
</table>

* p<0.05, **p<0.01
Medicaid-Private Insurance Differences in Health Care Use and Expenditures

- Higher use of hospital and ED services by Medicaid-enrolled children with SCD
- Average reimbursements lower for Medicaid enrollees with SCD than for those enrolled in private health plans
  - 28% lower expenditure per ED visit
  - 35% lower expenditure per inpatient stay
  - 45% lower outpatient expenditure per non-emergency outpatient clinician visit

Why Differences in Health Care Use by Insurance Type?

- Potential explanations for higher use in Medicaid
  - Poverty, disadvantage, comorbid conditions
  - Less use of preventive care, lower compliance
  - No copay
- Comparison of inpatient comorbid conditions among children with SCD by insurance type
  - Insignificant differences in frequencies of SCD-related conditions
  - Higher frequencies of asthma, fever, constipation, heart disease, metabolic disease
## Inpatient Diagnoses

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>ICD-9 codes</th>
<th>Medicaid (n = 2,428)</th>
<th>Private Insurance (n = 621)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sickle cell disease with crisis</td>
<td>282.42; 282.62; 282.64; 282.69</td>
<td>31.6%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Fever</td>
<td>780.6</td>
<td>20.4%</td>
<td>15.1%**</td>
</tr>
<tr>
<td>Acute chest syndrome and pneumonia</td>
<td>517.3; 480 - 486</td>
<td>16.3%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Chest pain &amp; coughing</td>
<td>786.2; 786.5</td>
<td>13.3%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Asthma</td>
<td>493</td>
<td>10.8%</td>
<td>4.0%**</td>
</tr>
<tr>
<td>Abdominal pain, &amp; splenomegaly</td>
<td>789.0; 789.2</td>
<td>9.6%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Constipation</td>
<td>564</td>
<td>8.1%</td>
<td>3.1%**</td>
</tr>
<tr>
<td>Cardiomegaly &amp; other heart disease</td>
<td>429.3; 420 - 429</td>
<td>7.2%</td>
<td>3.4%**</td>
</tr>
<tr>
<td>Acute respiratory infections</td>
<td>460 - 466</td>
<td>6.6%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Metabolic disorders</td>
<td>270 - 279</td>
<td>6.5%</td>
<td>3.7%**</td>
</tr>
<tr>
<td>Septicemia</td>
<td>38</td>
<td>4.6%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Viral infections</td>
<td>79</td>
<td>3.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Diseases of the gall bladder</td>
<td>574 - 575</td>
<td>3.0%</td>
<td>2.4%</td>
</tr>
<tr>
<td>Splenic sequestration</td>
<td>289.52</td>
<td>1.9%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>430 - 438</td>
<td>1.6%</td>
<td>2.1%</td>
</tr>
</tbody>
</table>

## Drug Claims and Expenditures and Total Expenditures During 2005

<table>
<thead>
<tr>
<th></th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>% with drug claim</td>
<td>93%</td>
<td>82%**</td>
</tr>
<tr>
<td>Drug claims per child with SCD</td>
<td>21</td>
<td>10.8**</td>
</tr>
<tr>
<td>Mean drug expenditure per child with SCD</td>
<td>$1,049</td>
<td>$531**</td>
</tr>
</tbody>
</table>

* p<0.05, **p<0.01

No difference in average expenditure per medication
• Calculated incremental expenditures as simple difference in mean expenditures between children with SCD and without SCD, stratified by insurance type
  – Comorbid conditions attributed to SCD
  – Not possible to adjust for socioeconomic status
  – In Medicaid data,
    • 3% of children with SCD were non-Hispanic White
    • 51% of children without SCD were non-Hispanic White

• Projected number of children in US with SCD
• Applied distribution of insurance type among children with SCD

### Incremental Expenditures Associated with SCD During 2005

<table>
<thead>
<tr>
<th></th>
<th>Medicaid</th>
<th>Private Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean expenditure for children with SCD</td>
<td>$11,013</td>
<td>$14,762</td>
</tr>
<tr>
<td>Mean expenditure for children without SCD</td>
<td>$1,679</td>
<td>$1,276</td>
</tr>
<tr>
<td>Ratio of mean expenditure</td>
<td>6.6</td>
<td>11.6</td>
</tr>
<tr>
<td>Incremental expenditure (absolute difference)</td>
<td>$9,334</td>
<td>$13,486</td>
</tr>
</tbody>
</table>

25% lower Medicaid expenditures per child with SCD despite higher use
How Do Relative Expenditure Ratios Compare with Previous Studies?

- Relative medical expenditures for affected and unaffected children
  - 10-12 times higher for Medicaid-enrolled children with cerebral palsy or spina bifida in WA (Ireys et al., *Pediatrics*, 1997)
  - 12-13 times higher for privately-insured children in MarketScan Commercial with spina bifida, Down syndrome, or muscular dystrophy (Ouyang et al., 2007; Boulet et al., 2008; Ouyang et al., 2008)

Pediatric SCD-Attributable Medical Expenditures in US, 2005

- Number of children with SCD 31,269
  - Incidence of SCD among Black children 1 in 396 (Lorey et al., 1996)
  - Assuming 90% of children with SCD are Black
- Weighted mean incremental expenditure of $10,716 per child
  - Assumed 32.6% private insurance, 67.1% public insurance (uninsured included), Boulet et al. (in press)
- National aggregate estimate $335 million in 2005 dollars
- Limitations
  - Medicaid expenditures understate cost
  - Inability to adjust for other determinants of health care costs other than race/ethnicity
Medical expenditures for US children with sickle cell disease: impact of payer and health plan type

- Assess impact of type of plan on medical expenditures for children with SCD
  - Medicaid fee-for-service (FFS)
  - Medicaid capitated (managed care)
  - Private fee-for-service
  - Private managed care
- Does payer type affect level and efficiency of medical care?

Study Hypotheses

- Children in capitated plans are less likely to use medical services compared to those in FFS plans
- Children in capitated plans incur lower expenditures compared to those in FFS plans
## Sample Sizes

<table>
<thead>
<tr>
<th>Plan type</th>
<th>Medicaid N=2,428</th>
<th>Private Insurance N=621</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Managed care</td>
<td>FFS</td>
</tr>
<tr>
<td>N</td>
<td>1,942</td>
<td>486</td>
</tr>
<tr>
<td>%</td>
<td>80%</td>
<td>20%</td>
</tr>
</tbody>
</table>

## Inpatient Service Utilization

- **Mean length-of-stay**
  - **Medicaid**
    - FFS: 3.8 days
    - Managed care: 3.5 days
  - **Private insurance**
    - FFS: 4.0 days
    - Managed care: 3.7 days
Mean Inpatient Expenditures per Child with SCD in 2005

- Medicaid: managed care 10% lower (NS)
- Private Insurance: managed care 15% lower (NS)

Emergency Department (ED) Utilization

- Medicaid enrollees
  - FFS 50%
  - Managed care 58%
- Private insurance
  - FFS 46%
  - Managed care 43%
- Among those with at least one ED visit
  - mean number of ED visits ≈2
Mean ED Expenditures per Child with SCD

- **Medicaid**: Managed care 35% higher (p=.004)
- **Private Insurance**: Managed care 40% lower (NS)

### Outpatient Service Utilization

- **Number of outpatient visits during 2005**:
  - Medicaid
    - FFS 18
    - Managed care 13
  - Private insurance
    - FFS 13
    - Managed care 13
Mean Annual Outpatient Expenditures per Child with SCD in 2005

- Medicaid: managed care 11% lower (NS)
- Private Insurance: managed care 29% lower (NS)

Drug Claims

- Mean Number of Drug Claims
- Medicaid (prescription and OTC)
  - FFS: 26
  - Managed care: 20
    - 25% lower prescription drug claims (p<0.001)
- Private insurance (prescription only)
  - ≈ 11 drugs per child
    - no significant difference
Mean Annual Drug Expenditures per Child with SCD in 2005

- **Medicaid**: managed care 50% lower ($p<0.001$)
- **Private insurance**: managed care 16% lower (NS)

Mean Expenditures per Child

- **Medicaid**: managed care 14% lower (NS)
- **Private Insurance**: managed care 20% lower (NS)
Limitations

- Unidentified 8 states
  - Representativeness of Medicaid data
    - 80% of MarketScan Medicaid sample in managed care plans
    - Nationally 65% of Medicaid enrollees enrolled in managed care plans
  - Region
- Small sample size for private insurance
- Expenditures for capitated plans imputed

Summary (1)

- Do children with SCD enrolled in managed care plans use fewer services than those in FFS? Mostly not
- Medicaid
  - Inpatient: similar rate, 8% lower length of stay
  - ED care: 9% higher for managed care
  - Other outpatient care: 27% lower for managed care
  - Drugs: 23% lower for managed care
- Private insurance – no difference by plan type
Summary (2)

- Do children with SCD enrolled in capitated plans incur lower expenditures than those in FFS plans?
- Slightly (14 to 20%) lower mean expenditures
  - Not statistically significant
  - Inpatient care: 10-15% lower (NS)
  - ED care: mixed results
  - Other outpatient care: 11-29% lower (NS)
  - Drugs: 50% lower for Medicaid managed care
- Expenditure data for capitated plans imputed, less reliable

Contact Information

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