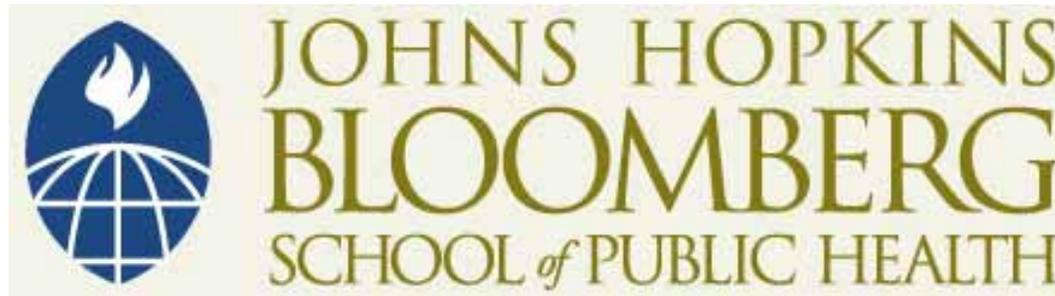


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Registries, Reminders, and Recalls

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Johns Hopkins University

- After listening to, viewing, and studying the lecture materials in this course, you will be able to do the following:
 - Describe an immunization registry and how it benefits parents, providers, and the public
 - Identify the main constraints on registry development and propose appropriate strategies to maximize their use
 - Understand the importance of reminders and recalls



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Section A

Registries and How They Work

- **Immunization registry:** “A confidential, population-based, computerized information system that collects vaccination data about all children within a geographic area” (INVAC, 1998)

History of Immunization Registries

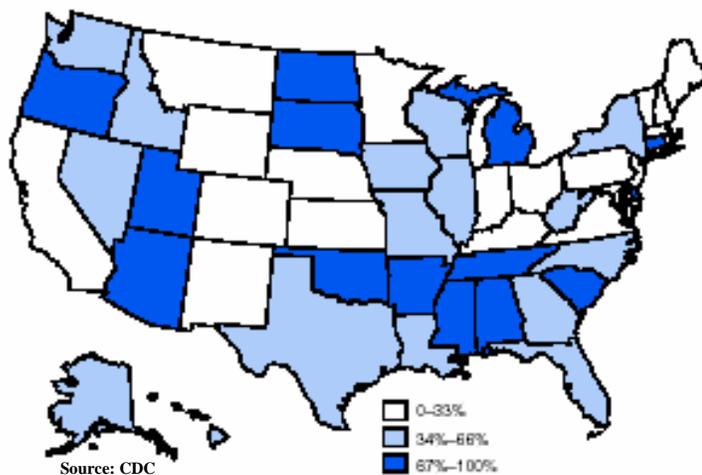
- The earliest U.S. immunization registries date back to the 1960s
- These were manual tracking systems using birth certificates to monitor individual catchment areas
- 1974: Delaware launched the first statewide registry; it continues to capture data from all vaccine providers
- In 1980, CDC's National Immunization Program (NIP) developed the first computer-based registry, the Automated Immunization Management System (AIMS)
- The initially slow response to the 1989–91 measles epidemic convinced many public health practitioners of the need for a nationwide immunization registry

Continued

History of Immunization Registries

- Since 1993, CDC and the Robert Wood Johnson Foundation's All Kids Count program have provided over \$262m to develop registries in all 50 states
- Today, registries cover about 44% of U.S. children

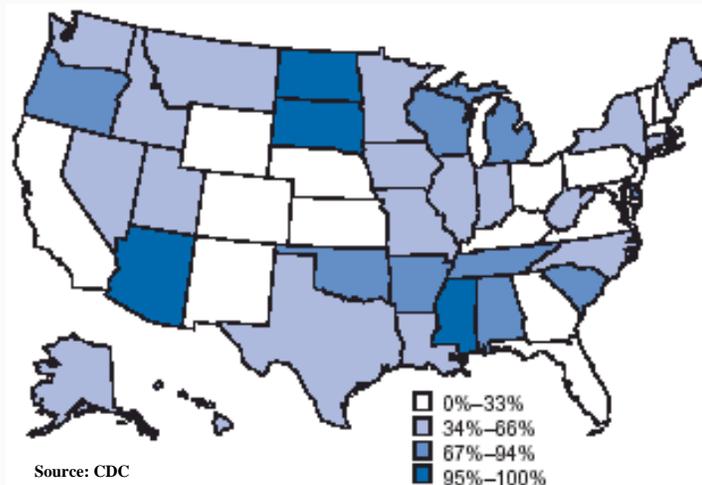
- Percentage of children aged <6 years with two or more vaccinations in a Public Health Service Act § 317b immunization registry—United States, 2001



▼ Notes Available

MMWR. 2002. Vol 51/No.34, 161.

- Percentage of children aged <6 years with two or more vaccinations in a Public Health Service Act § 317b immunization registry—United States, 2002



Why Are Registries Needed?

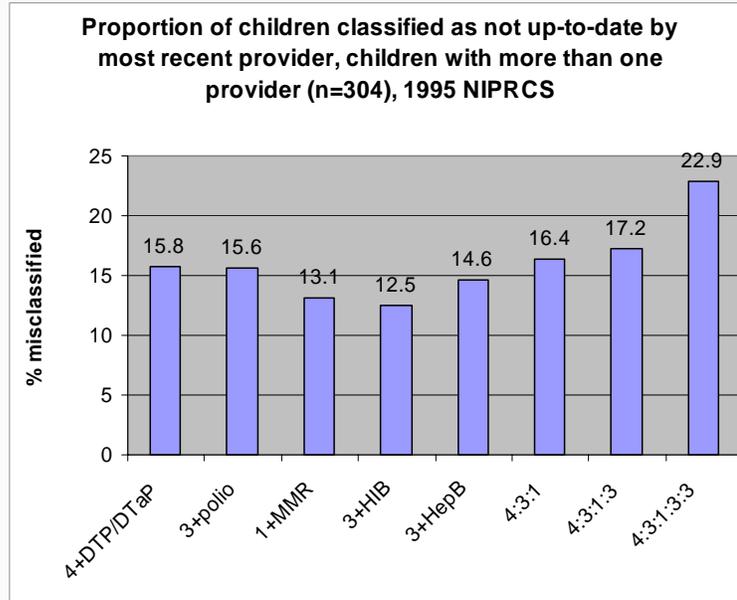
- Because patients often change providers, immunization records are scattered
- Patients and providers cannot keep track of an increasingly complex immunization schedule
- Up-to-date data on each patient allow reminders and recalls to be generated as needed
- Provider practices can be continuously monitored
- Local information pinpoints where to implement effective, resource-intensive strategies to increase coverage
- Adverse events and effects of immunization policy changes can be tracked more carefully

Case Study: The Scattered Records Problem

- Stokley et al (2001) studied immunization histories from the 1995 U.S. National Health Interview Survey (NHIS)
 - Found that 22% of children aged 19–35 months received vaccinations from more than one provider
 - They then combined and analyzed provider records for those multiple provider cases

Case Study: The Scattered Records Problem

- Findings
 - Based only on the most recent providers' records, vaccine coverage was underestimated by 10–12%
 - Based only on the first providers' records, the underestimates ranged from 27–46%
 - Based on a randomly selection of all providers' records, the underestimates ranged from 19–29%
- The most recent providers misclassified 13–23% of up-to-date children as not up-to-date

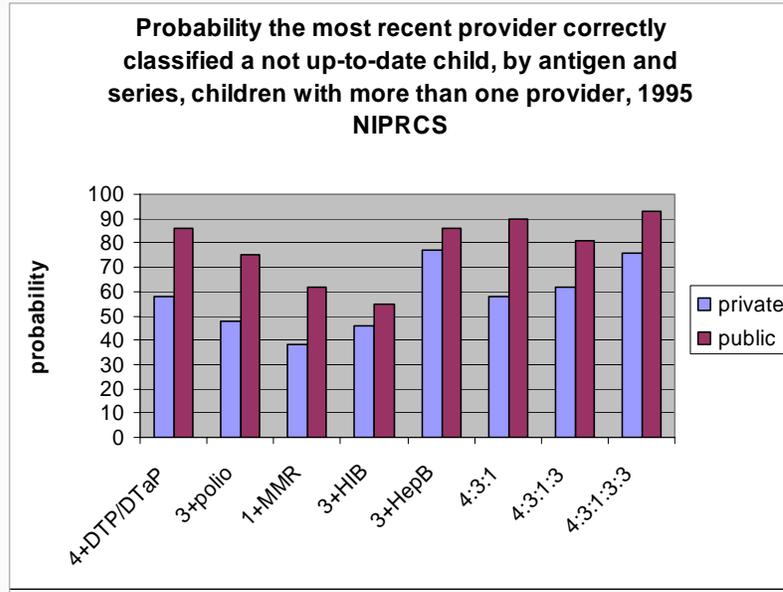


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Source: Stokley et al 2001

Case Study: The Scattered Records Problem

- Of the most recent providers:
 - 64% of the cases were private practices
 - 23% public clinics
- The probability that a child classified as “not up-to-date” really was not up-to-date for a given antigen or series was high for both types of providers



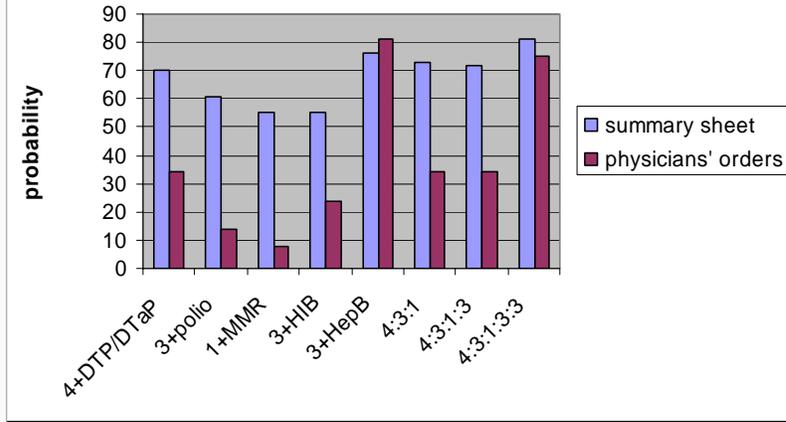
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Source: Stokley et al 2001

Case Study: The Scattered Records Problem

- If the provider used a summary sheet showing all immunizations given to a child, the probability of misclassification was lower than if she had merely gleaned the immunization data from physicians' orders entered into the chart

Probability a not up-to-date child was correctly classified by the most recent provider, by information source and antigen, children with more than one provider, 1995 NIPRCS



▼ Notes Available

Source: Stokley et al 2001

Case Study: The Scattered Records Problem

- Conclusions
 - At any given moment, 150,000 fully immunized children in the U.S. are incorrectly classified as needing more vaccinations due to scattered records
 - Community immunization registries would greatly reduce the problem

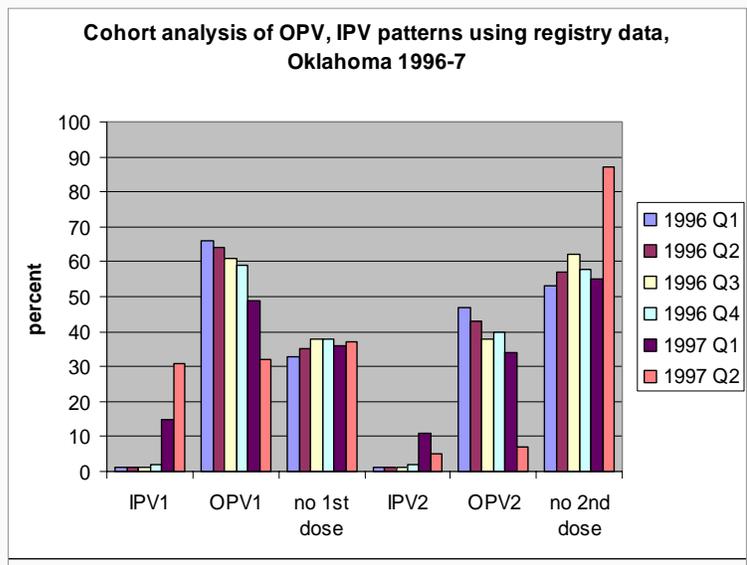
Case Study: Effects of Policy Changes

- Data from 250 facilities were extracted from Oklahoma's state immunization registry in August, 1997
- n~32,000 children born January 1, 1996 to June 30, 1997
- Question
 - Given a policy decision to use only IPV (injected), are cohorts of children as likely to be as up-to-date as those previously given OPV (oral)?

Type polio dose 1 received by 3 months of age				
Cohort	N	IPV	OPV	none
1996 Q1	5471	1%	66%	33%
1996 Q2	5788	1%	64%	35%
1996 Q3	5898	1%	61%	38%
1996 Q4	5118	2%	59%	38%
1997 Q1	4571	15%	49%	36%
1997 Q2	3744	31%	32%	37%

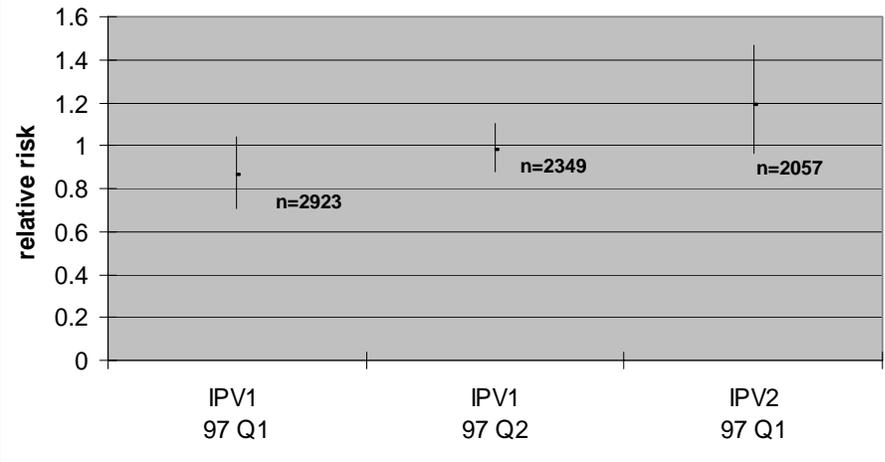
Continued 19

Type polio dose 2 received by 5 months of age				
Cohort	N	IPV	OPV	none
1996 Q1	5471	1%	47%	53%
1996 Q2	5788	1%	43%	57%
1996 Q3	5898	1%	38%	62%
1996 Q4	5118	2%	40%	58%
1997 Q1	4571	11%	34%	55%
1997 Q2	3744	5%	7%	87%



- By mid 1997, IPV1 coverage equaled OPV1 coverage
- However, the IPV2/OPV2 coverage gap remained wide
- Let's look at the relative risk of not being up-to-date, given IPV vs. OPV usage

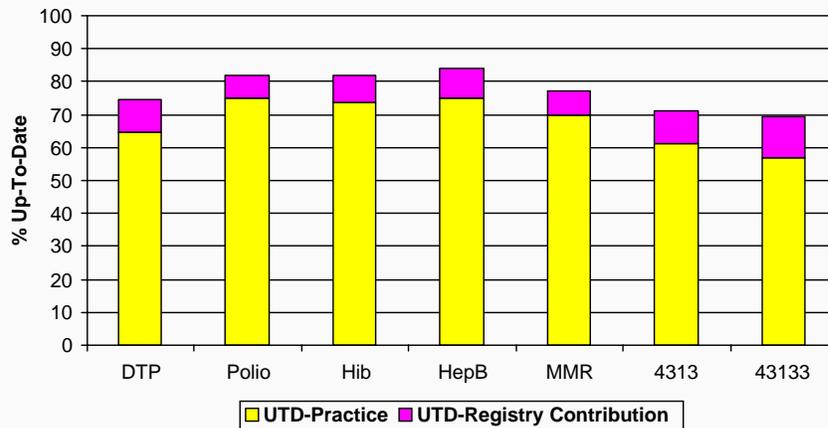
Relative risk of not being up-to-date, IPV vs OPV vaccination, children born 1/96-6/97, Oklahoma Immunization Registry



- Overall, children who received IPV were as likely to be up-to-date than those who received OPV
- Although statistically insignificant, the pattern suggests that children given IPV2 were less likely to be up-to-date than those in earlier cohorts who were given OPV2
- Possible reasons
 - Painful side reactions to IPV1
 - Providers' reluctance to give injections
 - The vaccine policy shift

- Where population-based registries are working and have attained high coverage, their results are more reliable than other data sources
- Example: New York City (Irigoyen, 2000)
 - 11 randomly selected pediatric practices compared to registry data
 - Practice-based (CASA) assessments showed 61% UTD
 - Registry data increased figure to 71%

Contribution of Registry to Practice Coverage by Antigen



▼ Notes Available

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Source: Irigoyen 2000

This graph shows the up-to date rates by antigen and combination antigen. The yellow bar is the coverage levels as per the chart audits, and the pink bar on top is the contribution of the NYC registry. The contribution of the NYC registry was about 10%, and it varied by antigen. The antigens that required more doses showed the highest increase.

Registries Are Cost-Effective

- Horne (1999) analyzed cost data from 16 registries
- While developing, the registries spent an average of U.S.\$16/child/year
- Once fully operational, costs were \$4/child/year and \$3/encounter
- Extrapolating to national level
 - Estimated annual cost of registries: \$78.2m
 - \$5/child/year
 - Estimated cost offsets: \$107.5m
 - Estimated annual savings: \$29.3m



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Section B

Implementation Problems

Goals of a Registry

- Create a unique record for each vaccine-eligible child at birth or at first contact
- Allow providers to readily access and update each child's immunization record
- Generate immunization information for parents
- Help public health authorities monitor area coverage, track vaccination policy impacts, and identify adverse events

Web Access to New York City's Immunization Registry

The screenshot shows a Microsoft Internet Explorer browser window with the following content:

- Address Bar:** <http://www.nyc.gov/html/doh/html/or/or.html>
- Page Header:** NYC Department of Health & Mental Hygiene - Citywide Immunization Registry - Microsoft Internet Explorer
- Navigation:** File, Edit, View, Favorites, Tools, Help
- Address Bar:** Back, Forward, Stop, Refresh, Home, Search, Favorites, Media, Print, Mail, Chat, RSS, Feeds, Print, Mail, Chat, RSS, Feeds
- NYC gov Health** logo
- NEW YORK CITY'S HEALTH & MENTAL HYGIENE WEB SITE**
- Citywide Immunization Registry**
- Citywide Immunization Registry**
New York City Department of Health and Mental Hygiene
2 Lafayette Street / 19th Floor
New York, NY 10007
- Registry** button: look up records & report immunizations
- For information and immunization records, call: 212-676-2323**
- Navigation Links:**
 - [Mission Statement](#)
 - [About the CIR](#)
 - [Information for Providers](#)
 - [Information for Parents](#)
 - [DOHMH Publications](#)
- Image:** A circular image of a woman and a child.
- Quote:** "Healthy Children, Right From the Start!"
- Taskbar:** Start button, Internet Explorer icon, Microsoft PowerPoint icon, NYC Department of H... icon, System tray showing 4:59 PM.

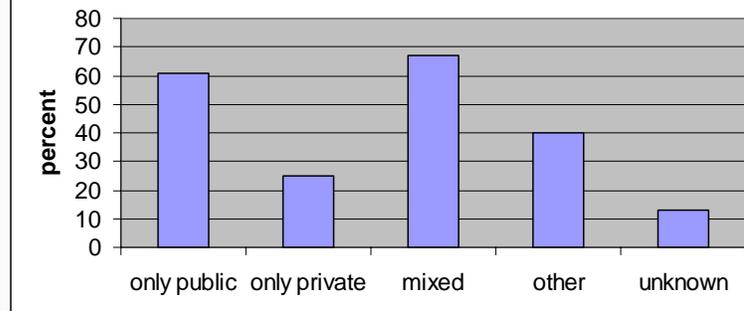
Why Is Coverage So Low?

- Most observers agree that registries are needed to meet these goals
- Yet, after over a decade of concerted efforts, registries reach only 44% of U.S. children
- Why?
 - A key problem is lack of private provider participation
- Let's analyze this problem

Define the Problem

- Immunization registries have trouble recruiting private sector providers
- When they are recruited, private providers often under-report their immunizations

Percentage of children 12-35 months old who had a provider report their immunization status to a registry, by provider type, 39 population-based registries, 2000



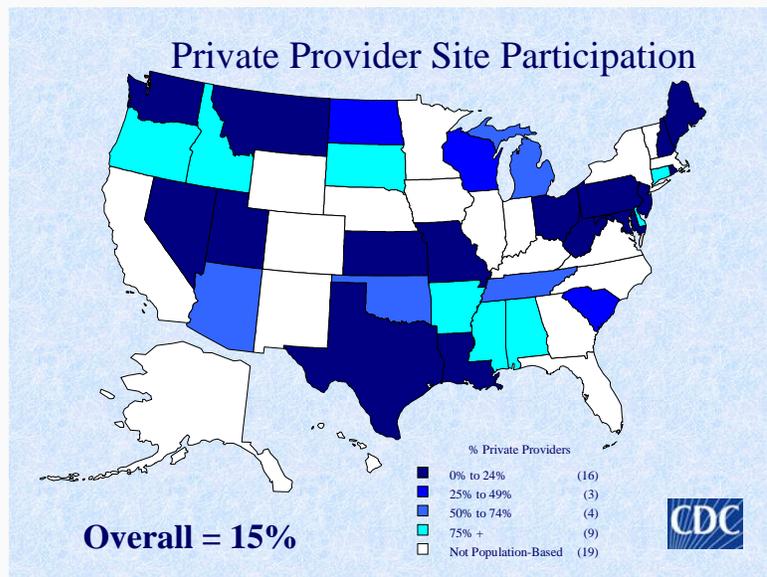
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Source: Linkins, 2000

Magnitude of the Problem

- In 2000, 13% of public providers and 41% of private providers were enrolled in registries
- Private providers account for 55% of all immunizations in the United States (LeBaron et al, 2001)

Proportion of Participation



▼ Notes Available

35

Source: Linkins, 2000

Forces Determining Registry Participation

- Federal and state governments oblige all providers (public and private) to report their performance and coverage indicators as a condition for free vaccine provision (Vaccine for Children Initiative)
- About 70% of private providers participate
- Most meet the reporting requirement using data manually abstracted from randomly sampled clinical charts (e.g., CASA)

Forces Determining Registry Participation

- Political
 - Private providers not involved from conception of registry
 - Private providers fear the information will be used to evaluate them
 - Private providers fear over-regulation
- Technical
 - Some private providers don't have PCs, Internet access
 - Software for private providers to access registry data online not yet ready
 - Need for ongoing technical support
 - Providers doubt registry data quality

Continued 37

Forces Determining Registry Participation

- Economic
 - Registries create a new recurrent cost to private providers
 - Economic benefits of registry participation not demonstrated
- Other
 - Few positive precedents cooperating with public sector
 - Legal liability, confidentiality

Possible Interventions

- Political
 - Invite private MDs to join State Registry Task Force
- Technical
 - Provide training, support for upgrading computer-based MIS in private practices, clinics
 - Demonstrate quality, usefulness of registry data
- Economic
 - Cost-benefit analysis of registry participation
- Other
 - Indemnify (hold harmless) private providers from legal liability related to registries

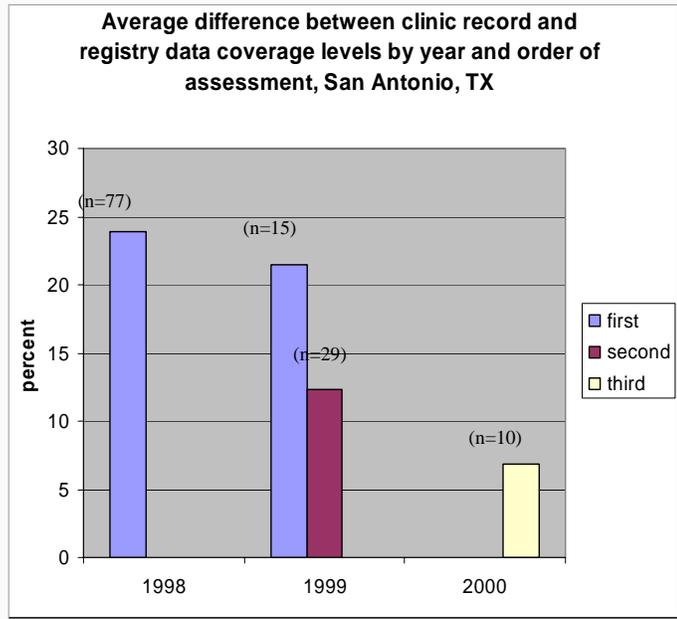
- Let's look a study by Boyd et al (2002) that sought to demonstrate the completeness of San Antonio, Texas registry data

■ **Methods**

- Informal interviews identified lack of provider confidence
- CASA assessments of 77/210 clinics in 1998, 44 in 1999 and 10 in 2000 compared to corresponding registry record for each clinic
- Indicator: 4:3:1 coverage (DTP, Hib, MMR), ages 12–36 months

■ Results

- Mean clinic-record coverage: 39.8%
- Mean registry-derived coverage: 64.1%
- Identical estimates in only 8/92 clinics; all other clinical record reviews showed lower coverage
- Differences diminished for 29 clinics reassessed in 1999 and 10 reassessed again in 2000

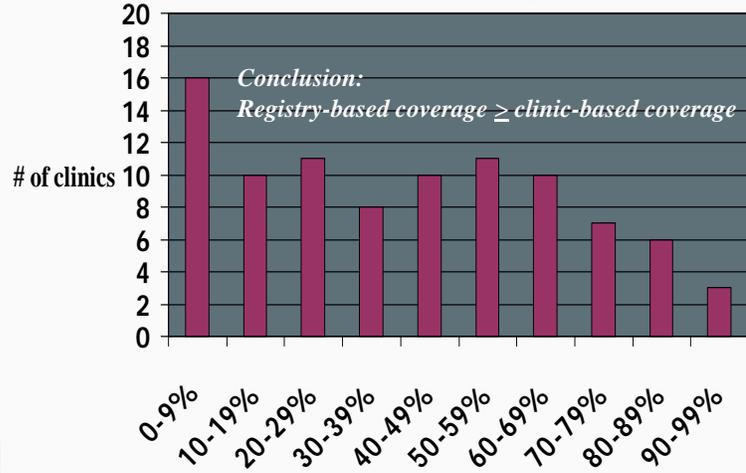


▼ Notes Available

Source: Boyd et al 2002

- Conclusions
 - Registry data more complete than clinic data in San Antonio, probably because it deals more effectively with scattered records
 - Provider performance may improve with each successive CASA review

- Percent difference between coverage levels based on clinic-based vs. registry-based data, San Antonio, 1998-99, n=92 clinics (Boyd et al, 2002)



- Many more studies are needed to generate the evidence necessary to convince private practitioners to participate
- But is science alone sufficient?
- Consider the contrasting logics of public and private providers
 - Public sector providers are expected to provide immunization information to states as part of their ongoing duties
 - Private sector providers do not have this duty; their imperative is profitability

- Coercing private sector providers to participate by legislative mandate has not worked
- When private providers perceive the value added by registries, they will participate
- Examples of value added
 - Point-of-contact efficiencies
 - Goodwill of clients
 - Public recognition

Costs Offset by Registries

- Horne et al (2000) surveyed public and private providers participating in 16 All Kids Count II project registries
- They analyzed 1997 data from the registries and from 15 private HMOs and clinics
- Findings
 - Mean cost/child in fully operational registry: \$3.91
 - Mean cost per encounter for manually retrieving children's immunization records: \$14.50
- A second study of three CA registries (Fontanezzi, 2000) showed that:
 - Worker productivity increased up to 50%

Other Provider Incentives

- More provider incentives are needed, including:
 - More cost-benefit, cost-effectiveness studies on provider registry use
 - Creation of popular demand for registries
 - Dissemination of lists showing participating providers
 - Integration of registry interface into other provider software and existing health information systems
 - Provision of regular feedback to providers

Remaining Technical Challenges

- Provide automatic feedback to each provider
- Generate appropriate electronic signatures for vaccination certificates
- Develop standard test cases to evaluate algorithms for eliminating duplicate records
- Integrate registries with communicable disease reporting
- Create linked Web-based and provider-based registries
- Enable electronic exchange across providers



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Section C

Reminders and Recalls

- A **reminder** is a notification that immunizations are due soon
- A **recall** is a notification that immunizations are past due
- Providers direct reminders and recalls to patients; registries allow them to be directed to patients and providers alike
- Reminders and recalls are relatively inexpensive and effective
- They may be linked to other programs and services

- Chambers et al (1991) performed an experiment to assess the effects of computer-generated reminders on the probability that clinicians gave influenza vaccination to eligible patients
- Methods
 - Reminders were incorporated into computerized clinical encounter forms for every visit
 - When the bill was paid, the reminder was removed

- Physicians were randomized into three groups:
Always Reminded, Sometimes Reminded, Never Reminded

Results

<i>Group</i>	<i>% immunized</i>	<i>n</i>
Always reminded	51	271
Sometimes reminded	38	72
Never reminded	30	218

- Patient characteristics were not predictive of immunization but number of visits was
- Attending physicians and fellows were more likely than residents to immunize
- When the Sometimes-Reminded clinicians did not receive a reminder, they were less likely than the Never-Reminded clinicians to immunize the patient

- The authors checked the charts of those unimmunized by Always-Reminded clinicians
 - One-half of the charts showed no reason for not immunizing
 - One-fourth had refused the vaccine
 - 15% actually did receive the vaccination, but it was unrecorded on the encounter form

Chambers et al (1991): Conclusions

- Simple provider reminders are effective overall, however:
 - Compliance is greater when two or more clinicians discuss the case
 - Clerical error rates remain high
 - Clinicians become dependent on the reminders so they should be provided at every encounter

- While registries produce reminders and recalls listing the specific antigens needed, general reminders and recalls are also effective
- Irigoyen et al (2000) evaluated different reminder methods in a New York City pediatric clinic serving a low-income population

- 1,273 children ages 4–18 months were randomized to one of four groups
 - Group P: postcards
 - Group T: telephone calls
 - Group P+T: both
 - Group C: none
- Results
 - 94% of Group P and P+T received cards
 - 53% of Group T and T+P received calls

- Children in any reminder group were more likely to keep their appointments
- Highest kept appointment rate: group P+T
- Children not UTD were less likely to keep appointments regardless of reminder method
- Vaccination coverage rates significantly improved in Groups P and T
- Cost per reminder: \$0.67 (P); \$1.58 (P+T)

Registry-Generated Reminders

- In large organizations, the combined impact of a registry and real-time reminder/recall systems can be dramatic

Case Study: Kaiser Permanente

- The HMO Kaiser Permanente covers 30% of California's children
- In 1998, Kaiser's registry contained information on 2m patients and 11m vaccinations
- The registry is used to generate reminders and recalls (outreach) and to generate point-of-contact reminders for providers (inreach)

Case Study: Kaiser Permanente

- The inreach procedure prints an “I” on the charts of all incompletely immunized children
- Over a two-week period in 1998, “I”s were printed on 1,074/3,462 (31%) charts
- 602/1,074 (56%) were immunized during the contact
- Using the inreach procedure, 25% more children were immunized in the same two-week period than in 1997 (Lugg et al 1999)

Are Registries/Reminders Sufficient to Reach Everyone?

- Perhaps not ...
- Lynch (1994) studied determinants of immunization performance of Glasgow, Scotland general practice physicians
- Scotland has a national immunization registry which includes a computerized system of reminders and recalls
- Providers have cash incentives to attain high immunization levels in their coverage areas

- Despite the reminders and recalls, 25% of providers failed to meet the targets in 1991
- Local poverty level and the amount of income the GP received for past immunization performance (bonuses expressed as a proportion of total revenue) were predictors of local vaccine coverage
- Conclusions: provider incentives, reminders, and recalls all help raise immunization levels—but they can't entirely overcome health inequities

- Immunization registries are a superior method of tracking children's immunizations and provider performance
- The main barriers to their use are their complexity and the reluctance of private practitioners to participate
- Reminders and recalls are effective in raising coverage rates
- Registries, reminders, and recalls may not be enough to overcome all health inequities