

## **Mode and respondent effects in a dual-mode survey of physicians: 2008-2009**

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### **Abstract**

The National Ambulatory Medical Care Survey (NAMCS) is an annual in-person survey of office-based physicians and visits to their practices. Since 2008, a supplemental sample of physicians has received a mail questionnaire with NAMCS questions on electronic medical record (EMR)/electronic health record (EHR) systems. In both survey modes, respondents could be either physicians or office staff. This paper compares how mode (mail or in-person) and survey respondent (physician or office staff members) affected estimates of EHR use in the 2008 and 2009 surveys. In both 2008 and 2009, the proportion of physician respondents was higher in the mail survey than the in-person survey. In 2009 only, reports of overall use were associated with survey mode and respondent type. After controlling for mode and respondent type in addition to quarter of the year, practice size, physician specialty, and urban location, the association between mode and EHR use remained significant though the association between respondent type and EHR use did not. Estimates of whether the physician had basic and fully functional EHR systems did not vary by respondent type or survey mode.

**Key Words:** Physician survey, dual mode survey, respondent effects

### **1. Introduction**

The National Ambulatory Medical Care Survey (NAMCS) is a nationally representative survey of office-based physicians and their patient visits. NAMCS has monitored physician use of electronic medical record (EMR)/electronic health record (EHR) systems since 2001. (The main difference between EHRs and EMRs is the ability of EHR systems to exchange information between health care providers. The terms EMR and EHR are often used interchangeably, and for simplicity, we use the term “EHR” to refer to either in this paper.) NAMCS estimates of physician EHR adoption have been used by the Office of the National Coordinator (ONC) for Health Information Technology to monitor progress toward the 2004 Health Information Technology Initiative’s goal of universal adoption of electronic health record (EHR) systems by most health care providers by 2014 (1). ONC’s charge to promulgate and monitor adoption of EHR systems became more prominent with the passage of the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act which includes \$19 billion in Medicare and Medicaid incentive payments to encourage adoption and “Meaningful use” of EHRs (2). In 2008 and 2009, ONC provided funding to NCHS to conduct a mail survey that focused on EHR adoption in conjunction with the usual NAMCS. The larger

sample size, supplemented by the mail survey, permits more detailed analysis of physician EHR system adoption patterns. This study assesses the reasonableness of combining data from the two modes by examining whether there were reporting differences by survey mode (mail versus in-person) or respondent type (physician versus office staff) for key EHR questions collected in the 2008 and 2009 surveys.

## 2. Methods

### 2.1 Dual-mode NAMCS sample design

NAMCS is an annual nationally representative survey of visits to non-federal office-based physicians in the United States, excluding radiologists, anaesthesiologists, and pathologists. Each year, a sample of office-based physicians who report that they provide direct patient care is taken from the master files of the American Medical Association (AMA) and the American Osteopathic Association (AOA). The multi-stage NAMCS sample design includes a sample of 112 geographic primary sampling units (PSUs) and then a sample of physicians within PSUs. Before sampling, physicians are first stratified by their specialty within PSUs. In addition to AMA/AOA physicians, the dual-mode file analyzed included physicians selected from an extra stratum of community health centers (CHCs) (3).

NAMCS methodology involves an induction interview with physicians, followed by collection of data from an average of 30 visits to that physician during a random week of the year. The induction interview is used to determine eligibility for the survey, as well as to collect physician and practice characteristics, such as adoption of EHR. Since 2005, NAMCS has collected more detailed information about EHR systems (4-6). The content of the 2008 and 2009 mail questionnaire was comparable to questions asked in the in-person interview with a few exceptions.

For the 2008 and 2009 NAMCS, physician samples were randomly assigned to a survey mode. In both years 3,200 physicians were assigned to receive an in-person interview, the usual mode for NAMCS, and 2,000 were assigned to the mail survey. The survey period for in-person interviews is the calendar year (January through December 2008 and January through December 2009). In contrast the mail surveys were conducted during a two month interval each year (April through May 2008, and March through April 2009). The U.S Census Bureau field representatives conducted the NAMCS interviews and SRA International, Inc. conducted the mail survey.

The mail survey included follow-up for refusals and non-locatables. For the 2008 mail survey, three samples were selected for follow-up efforts. NCHS staff conducted telephone follow-up for a random sample of 200 refusals with no eligibility information. Follow-up for non-locatables involved two simple random samples of 100 each. The Census Bureau conducted follow-up of 100 non-locatable cases by in-person interview, while NCHS staff conducted telephone follow-up and web searches for the other sample of 100 non-locatable cases (7). Building on this experience, in 2009 SRA International, Inc. conducted telephone follow-ups for all non-respondents and refusals with no eligibility information, as well as extensive web searches for non-locatables. As a result of this increased effort, the overall percent of responses completed through follow-up procedures increased from 6 to 12% in 2009. All follow-up information was used to adjust the final response rate and final estimation procedures for the mail survey.

## 2.2 Data analysis

This study combined 2008 and 2009 cases from 3,136 in-person interview responses and 1,848 mail survey responses. Based on Office of Management and Budget standards for calculating response rates (8), the final 2008 response rate for the mail survey (62%, weighted and unweighted) was similar to that for in-person interviews (64%, weighted and unweighted) (9). In 2009, the weighted response rate for the mail survey increased to 72% (73% unweighted), while the in-person survey interview response rate was 62% (weighted and unweighted) (10). Due to the follow-up procedures used in the mail survey, responses were tri-modal (mail, in-person interview, and telephone). In the analysis that follows, all responses to the mail survey including responses obtained by telephone or in-person interview are grouped because a separate analysis of in-person interview vs. telephone vs. mail yielded no statistical differences.

Our goal was to determine if estimates of EHR use varied by mode or respondent type. We considered several measures of EHR use, including a general question on EHR use; detailed questions about the EHR system's functionalities; and whether the respondent reported having a basic or fully functional EHR system. The general question on EHR use asked: "Does this practice use electronic medical records/electronic health records (not including billing records)?" A positive response could either be a fully electronic system or a system that was part paper and part electronic. Because unknowns for this general EHR question were small in both 2008 (1.5%) and 2009 (0.5%), unknowns were combined with "No" responses in the analysis that follows. Specific EHR functionalities examined included whether the computerized system included capabilities for patient history and demographics, patient problem lists, physician clinical notes, medical history and follow-up notes, computerized orders for prescription as well as lab tests, warnings for drug interactions or contraindication, the electronic submission of prescriptions to the pharmacy, electronic submission of lab test orders, the ability to view lab results as well as imaging results, the ability to return electronic images, and reminders for guideline-based interventions or screening tests. Finally, we considered whether respondents reported having systems with basic or fully functional capabilities. Basic EHR systems are computerized systems with six basic functions: patient demographics, patient problem lists, physician clinical notes, computerized orders for prescriptions, and the ability to view laboratory and imaging results (11). Systems defined as fully functional include all of the features of basic systems plus the following additional features: medical history and follow-up, computerized orders for tests, electronic submission of prescription and lab test orders, warnings for drug interactions or contraindications, highlighting out-of-range test levels, images returned electronically, and reminders for guideline-based interventions (11). Fully functional systems are a subset of basic systems.

We first examined overall respondent-defined EHR use by mode and respondent type. *T*-tests were used for comparisons. All tests were evaluated at  $p \leq .05$  level. We then used logistic regression to examine overall EHR use as a function of mode and respondent type, while controlling for additional variables known to affect EHR use including survey year and quarter, practice size, physician specialty, and urban location. Finally, we tested whether responses as to specific EHR functionalities or having a basic or fully functional system varied by mode and respondent type. All analyses were performed using the statistical packages SAS version 9.2 (SAS Institute, Cary, N.C.) and SUDAAN version 9.0 (Research Triangle Institute, Research Triangle Park, N.C.).

### 3. Results

In 2008, 26% of NAMCS in-person interviews were completed by physicians, 60% by office staff, and 14% by unspecified respondent types (Table 1). In contrast, a majority of the mail survey (52%) was completed by physicians, 48% were completed by office staff, and for 1% respondent type was unknown. By 2009, this difference in respondent by mode became more pronounced; only 10% of in-person interviews were completed by physicians, while 62% of mail survey respondents were physicians.

Figure 1 shows that response to the general question on EHR use was significantly associated with survey mode in 2009, but not in 2008. The percent of physicians using EHRs did not vary by mode in 2008. In 2009, positive responses to this question varied significantly by mode; 53.7% of interview respondents reported using any EHR system, but only 43.0% of mail survey respondents reported using any EHR system.

Figure 2 examines EHR use by respondent type. The percent of physicians reporting use of EHR was similar to the percent for office staff and unknown respondent type in 2008. In 2009, however, physicians were less likely to report use of EHRs (42.8%) than office staff (50.4%) and unknown respondent types (52.4%).

Controlling for respondent type in addition to survey year, quarter of survey year, practice size, physician specialty, and urban location, the estimate of EHR use was significantly lower from the mail survey than from the in-person survey (Table 2). There was no difference in EHR use by respondent type, after controlling for all other characteristics.

Table 3 presents the percentage of physicians whose system had each EHR functionality by survey mode in 2008 and 2009. In 2008, there were no significant differences by survey mode for any EHR feature. In 2009, however, there were mode differences in the percentage of physicians reporting having patient problem lists, having physician clinical notes, being able to view lab results, and having reminders for guideline-based interventions and screening tests, with higher percentages of interview respondents reporting their system included these functions than mail survey respondents.

There were no significant associations between individual EHR functions and respondent type in 2008 (Table 4). When there were significant associations between individual EHR functions and respondent type in 2009, physicians reported lower availability of the function than office staff respondents. However, in both 2008 and 2009, there were no differences in the percentage of physicians with basic or fully functional systems by survey mode or respondent type (Table 5).

### 4. Conclusions

Our study found that estimates of EHR use by physicians based on the general question was higher when reported in in-person interviews than in the mail survey. This finding held after controlling for respondent type, survey year, quarter of year when the survey was conducted, practice size, physician specialty, and urban location. Reported EHR use did not vary by respondent type, after controlling for the same characteristics. Clearly, response processes can vary depending upon mode. Interviewer-administered questions are answered based on auditory cues, whereas mail survey questions are answered based

on visual cues, which invoke different psychological processes. Also, respondents control the pace and order of responding to questions on mail surveys, thus affecting context and interpretations of items. The questions do involve some subjectivity as well (for example, in judging whether their interaction with a system qualifies as “using” it). It is possible that mail survey respondents were less likely to conclude that they had an EHR system because they had more information readily available while making response judgments, although the data at hand do not permit us to determine which mode produced more accurate responses.

Although mode differences existed for responses to the general question about using an EMR/EHR system, there were no mode or respondent differences for EHR use as defined by systems having specific functionalities in 2008. In 2009, mode differences were found for patient problem lists, physician clinical notes, viewing lab results, and guidelines-based interventions and screening test. Respondent differences were also observed in 2009 for patient demographics, patient problem lists, physician clinical notes, warnings for drug interactions/contraindications, and guidelines-based interventions and screening test. However, in contrast to mode differences observed for the general question on EHR use, there were no differences in estimates of the percentage of physicians with basic or fully functional EHR systems by either survey mode or respondent type. The latter findings suggest questions about the existence of specific EHR features may be less subjective than a general question on EHR use.

The lack of mode or respondent effects on the percentage of physicians with EHR systems that are fully functional or at least have basic functions is important for policy reasons. Comparability of responses gives greater credibility to dual mode survey estimates of physicians that have these EHR systems, which may be useful to policymakers administering the HITECH incentives payment program. Physicians with fully functional or basic EHR systems are more likely to meet the “Meaningful Use” requirements needed to qualify for 2009 HITECH incentive payments. Physicians with these systems may also be able to significantly affect the quality of patient care delivered in physician offices, one of the goals of the HITECH incentive payment program. Thus, continued assessment of the comparability of responses in dual mode surveys is needed in future years of the surveys.

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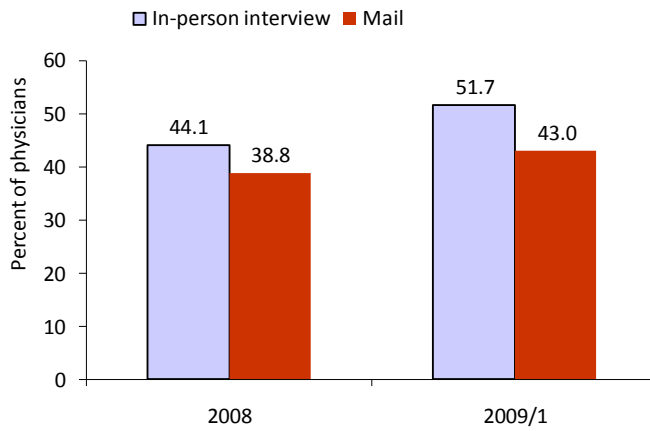
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**Table 1: Distribution of respondent type (percent) by survey: 2008 and 2009.**

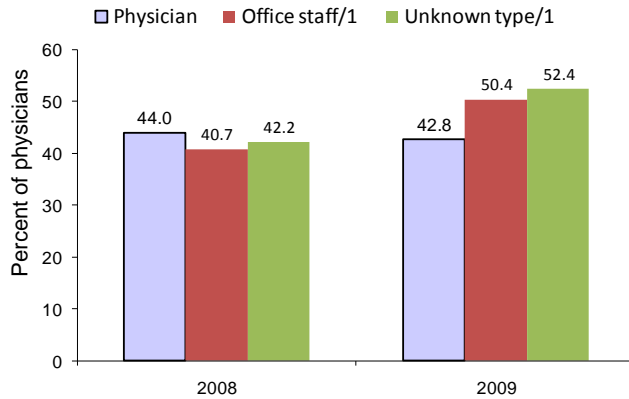
<i>Year and respondent type</i>	<i>In-person interview</i>	<i>Mail survey</i>
2008		
Physician	26%	52%
Office staff	60	48
Unknown type	14	1
2009		
Physician	10	62
Office staff	77	38
Unknown type	13	1

Figure 1. Percent of physicians using electronic health records by mode and year



1/ Difference by mode is statistically significant ( $p < 0.05$ ).  
SOURCE: CDC, NCHS, National Ambulatory Medical Care Survey.

Figure 2. Percentage of physicians using electronic health records by respondent type and year



1/ 2009 difference with physician percentage is statistically significant ( $p < 0.05$ ).  
SOURCE: CDC, NCHS, National Ambulatory Medical Care Survey.

**Table 2. Adjusted percent of physicians using EHRs and odds ratio of EHR use.**

Selected characteristics	Adjusted percent using EHRs	Odds ratio of EHR use (95% CI)	
<b>Year</b>			
<b>2008</b>	<b>42</b>	<b>Reference</b>	
<b>2009</b>	<b>48</b>	<b>1.28</b>	<b>(1.06,1.54)</b>
<b>Survey mode</b>			
<b>In-person interview</b>	<b>49</b>	<b>Reference</b>	
<b>Mail</b>	<b>40</b>	<b>0.65</b>	<b>(0.49,0.87)</b>
<b>Respondent type</b>			
<b>Physician</b>	<b>47</b>	<b>Reference</b>	
<b>Office staff</b>	<b>44</b>	<b>0.87</b>	<b>(0.69,1.09)</b>
<b>Unknown</b>	<b>46</b>	<b>0.94</b>	<b>(0.69,1.29)</b>
<b>Practice size</b>			
<b>Solo</b>	<b>31</b>	<b>Reference</b>	
<b>Partner</b>	<b>36</b>	<b>1.24</b>	<b>(0.91,1.71)</b>
<b>3-5 physicians</b>	<b>45</b>	<b>1.79</b>	<b>(1.43,2.25)</b>
<b>6-10 physicians</b>	<b>52</b>	<b>2.45</b>	<b>(1.90,3.17)</b>
<b>11 or more physician</b>	<b>79</b>	<b>8.51</b>	<b>(6.11,11.84)</b>



**Table 3: Selected EMR/EHR characteristics by survey mode in each survey year.**

Year and characteristic	In-person interview	Mail survey	<i>T-test</i> p-value
<b>2008</b>			
Patient history and demographics	78.8%	76.5%	.60
Patient problem list	33.0	35.4	.55
Physician clinical notes	42.3	39.4	.47
Medical history/follow-up notes	35.6	34.0	.69
Prescription order entry	37.6	34.1	.39
Drug interaction/ contraindication warning	27.4	24.2	.35
Prescriptions sent to pharmacy electronically	23.4	22.2	.71
Lab test order entry	32.8	27.3	.09
Test orders sent electronically	19.7	19.2	.87
View lab results	52.2	52.3	.98
Highlight out of range values	38.9	41.6	.55
View imaging results	44.9	45.6	.88
Electronic images returned	20.5	27.0	.14
Guideline-based interventions or screening tests	31.2	26.8	.20
<b>2009</b>			
Patient history and demographics	81.6	84.4	.14
Patient problem list	42.6	37.3	.02
Physician clinical notes	49.5	43.8	.02
Medical history/follow-up notes	43.4	39.7	.16
Prescription order entry	42.6	44.6	.51
Drug interaction/ contraindication warning	35.3	34.0	.59
Prescriptions sent to pharmacy electronically	31.0	33.1	.36
Lab test order entry	39.4	36.8	.27
Test orders sent electronically	25.1	24.5	.79
View lab results	56.4	61.1	.05
Highlight out of range values	43.0	47.7	.06
View imaging results	48.4	50.4	.42
Electronic images returned	25.6	23.5	.34
Guideline-based interventions or screening tests	36.6	30.0	.01

**Table 4: Selected EHR characteristics by respondent type in each survey year.**

Year and characteristic	Physician	Office staff	<i>T-test</i> p-value
<b>2008</b>			
Patient history and demographics	75.3%	80.7%	.11
Patient problem list	32.8	35.1	.48
Physician clinical notes	41.3	42.2	.80
Medical history/follow-up notes	35.4	35.9	.89
Prescription order entry	35.7	37.2	.68
Drug interaction/ contraindication warning	26.7	26.8	.98
Prescriptions sent to pharmacy electronically	23.7	23.4	.92
Lab test order entry	33.0	29.7	.31
Test orders sent electronically	20.3	18.8	.59
View lab results	50.5	54.8	.26
Highlight out of range values	39.8	41.5	.66
View imaging results	43.2	47.9	.21
Electronic images returned	23.2	24.1	.80
Guideline-based interventions or screening tests	26.6	31.8	.12
<b>2009</b>			
Patient history and demographics	78.0	85.5	<.01
Patient problem list	34.6	43.5	<.01
Physician clinical notes	43.0	48.8	.03
Medical history/follow-up notes	38.4	43.3	.07
Prescription order entry	43.2	46.8	.16
Drug interaction/ contraindication warning	32.0	37.0	.04
Prescriptions sent to pharmacy electronically	31.3	32.4	.63
Lab test order entry	35.7	38.9	.21
Test orders sent electronically	23.7	25.2	.51
View lab results	56.5	59.5	.24
Highlight out of range values	44.9	45.5	.82
View imaging results	46.6	51.0	.10
Electronic images returned	23.7	25.4	.47
Guideline-based interventions or screening tests	27.7	37.4	<.01

**Table 5: Type of EHR system by survey mode and respondent type.**

Year and characteristic	Survey mode		<i>T-test</i> p-value
	In-person interview	Mail survey	
<i>2008</i>			
Basic system	16.9%	17.1%	.95
Fully functional system	4.9	3.7	.38
<i>2009</i>			
Basic system	22.7	20.4	.26
Fully functional system	7.5	6.1	.27
	Respondent type		
	Physician	Office staff	
<i>2008</i>			
Basic system	17.5%	17.0%	.85
Fully functional system	5.2	3.8	.25
<i>2009</i>			
Basic system	20.3	22.5	.33
Fully functional system	5.9	7.4	.27