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**Office for Oregon Health  
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**Changes in Access to Primary Care for  
Oregon Health Plan Beneficiaries and the  
Uninsured**

*The Emergency Department Perspective*

**November 2005**

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# **Changes in Access to Primary Care for Oregon Health Plan Beneficiaries and the Uninsured**

*The Emergency Department Perspective*

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## EXECUTIVE SUMMARY

Cutbacks in the Oregon Health Plan (OHP) have raised concerns about the impact on its beneficiaries. This project draws on literature demonstrating the usefulness of ED utilization as a measure of access to primary care, using data from the Oregon Health & Science University (OHSU) emergency department (ED) from August 1, 2001, through June 30, 2004, to study access to care for OHP beneficiaries and uninsured Oregonians, comparing ED use before versus after the March 1, 2003 cutbacks. This report updates an earlier report presented August 2003.

The results confirm the earlier study, reinforcing concerns about access to care for under-insured Oregonians. In brief:

- **There was a substantial drop in the proportion of ED visits by OHP enrollees, with a rise in the proportion by the uninsured. Reduced ED use by OHP enrollees could suggest better access to care outside the ED or that the co-payments instituted may have had the intended effect of decreasing unnecessary utilization. However, when these findings are interpreted in the context of other studies, the results suggest further deterioration of the safety net.** Interviews with safety net providers suggest that because of increased administrative burden, a growing number of community providers are retreating from Medicaid, particularly from OHP Standard patients (1), suggesting that the safety net is deteriorating, not improving. The present study suggests a drop in ED use for emergency medical conditions of the same magnitude as the drop for primary-care treatable problems. Therefore, reduced ED use by OHP enrollees that this study observed probably represents worsening access to care outside of the ED.
- **In studying ED visits for behavioral health problems (alcohol, chemical dependency, or other mental health diagnoses), we found a rise in the proportion of these visits by uninsured patients and a fall in the proportion by OHP enrollees.** The absolute numbers of drug- and alcohol-related visits reported were small but the consistency of the pattern for other psychiatric diagnoses suggests the validity of these findings. **These findings suggest disproportionate loss of the behavioral health safety net.**
- **The proportion of ED visits leading to hospitalization increased substantially for the uninsured, suggesting that these Oregonians may be deferring care until they are too sick for out-patient treatment.**
- **Reduced ED use and fewer patients on the OHP may yield a short-term cost savings for the state. However, the increased burden of uncompensated care will eventually force cost shifting, with increased costs and inefficiencies.**

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These results do not allow direct “cause-and-effect” conclusions about the impact of the OHP changes on access to care. However, combined with other findings from the Oregon Health Research Evaluation Collaborative, the data raise substantial concerns about access to medical care for poor and vulnerable Oregonians.

## INTRODUCTION

### *WHY ARE WE STUDYING THE OREGON HEALTH PLAN?*

The Oregon Health Plan (OHP) has recently undergone dramatic changes. In early 2003, Oregon redesigned the Oregon Health Plan, its Medicaid expansion program, in an effort to expand coverage within tight fiscal constraints. Using the new flexibility allowed states in the Health Insurance Flexibility and Accountability (HIFA) Demonstration Initiative and an 1115 waiver, the original policy goal of the redesign was to incrementally expand coverage for children, pregnant women, parents and childless adults from 170% of the federal poverty level (FPL) to 185% FPL. The planned expansion would maintain budget neutrality by offering tiered benefit packages and increased cost sharing.

The redesign, referred to as “OHP2,” comprised three Medicaid benefit packages: OHP Plus, OHP Standard and the Family Health Insurance Assistance Program (FHIAP), a premium subsidy program. The OHP Plus benefit package and cost sharing structure is similar to the original OHP and serves the population who are categorically eligible for Medicaid services under federal law (e.g. Temporary Aid to Needy Families, Old Age Assistance [OAA], disabled populations [SSI] and eligible Medicaid and SCHIP children). The OHP Standard benefit package, designed for Oregon’s adult expansion population (adults in families and adults without children), is leaner and for the first time implemented significant co-payments<sup>1</sup>. Additionally, while premiums have been charged to the expansion population since 1995, changes were made to the premium structure as part of OHP2, primarily administrative changes to the premium collection policy; OHP Standard eliminated discounts for couples and established new rules, discontinuing coverage immediately and instituting a six-month lockout for non-payment of premiums.

In March of 2003, as Oregon’s budget shortfall became more severe, the Oregon legislature eliminated coverage for outpatient behavioral health, dental, durable medical equipment, vision, and – for a brief period – prescription drugs for the OHP Standard

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<sup>1</sup> As a result of *Spry v US Department of Human Services, Centers for Medicare and Medicaid Services* and the Oregon Department of Human Services, a US District Court ordered the state to discontinue all co-payments for Oregon’s Medicaid expansion population, OHP Standard, effective June 19, 2004. The study reported here represents data before the co-payments were eliminated, however.

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population.<sup>2</sup> Except for increasing OHP eligibility for children and pregnant women and FHIAP eligibility to 185% FPL, the expansions that had been planned as part of the waivers were not implemented. February 2003 enrollment data showed 88,874 individuals enrolled in OHP Standard, but by the end of 2003 the OHP Standard population declined by 46%, to 47,957 covered lives. This decline stands in stark relief to the same time period in the previous year when this category changed from 93,722 (Feb., 2002) to 91,174 (Dec. 2002), a decline of 2.7%. Enrollment of OHP Standard was closed in July 2003 due to lack of state funding.

As these changes unfolded, the Office for Oregon Health Policy and Research (OHPR) and the Office for Medical Assistance Programs (OMAP) sought to monitor the impact of the changes on those who remained on OHP as well as those who lost their coverage. The efforts of these two agencies led to the formation of the Oregon Health Research Evaluation Collaborative (OHREC), a consortium of state agencies, academic researchers, and providers that has undertaken a series of studies on the impact of the OHP changes. One team of researchers looked at rates of disenrollment among OHP Standard members, finding a 50% fall in enrollment overall – with the lowest income members being the most likely to lose coverage. (2) Other OHREC researchers surveyed OHP enrollees and former enrollees, finding that OHP enrollees who lost coverage usually remained uninsured. Oregonians who lost OHP were more likely to report unmet health care needs and to lack a usual source of medical care. (3)

Also, during this time of tight budgets and cutbacks by the state government, Oregon was experiencing one of the highest unemployment rates in the country, and the state continued in a severe economic slump throughout the time of this study. High unemployment also led to large numbers losing access to employer-sponsored insurance, and with the OHP cuts and eventual freeze on OHP Standard enrollment, there were not opportunities for these newly uninsured to participate in public coverage options.

### ***WHY LOOK AT EMERGENCY DEPARTMENT USE?***

This report focuses on changes in patterns of emergency department (ED) use after the March 2003 OHP cutbacks. There are several reasons to study ED use:

- ***Preventable emergencies:*** When people lose access to primary care, they may defer care for chronic illnesses until they deteriorate and need emergency care. For example, an asthmatic patient without ongoing adjustment of therapy may

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<sup>2</sup> The 2003 Legislature under House Bill 2511, restored outpatient behavioral health, emergency dental services and limited durable medical equipment and supplies to the OHP Standard benefit package. These benefits were restored in August 2004, after data collection for this study was completed.

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become so short of breath that she or he needs life-saving treatment in the ED and a patient with hypertension who runs out of medication may present to the ED with life-threatening congestive heart failure, heart attack or bleeding into the brain.

- **Primary care treatable illnesses:** Patients in need of medical care may be forced to use the ED for lack of access elsewhere. A patient in severe pain from a dental infection may come to the ED for antibiotics, pain medication, and initial treatment because there is no dentist to see him or her without advance payment and a woman with a bladder infection may seek ED care – or she may wait until the infection progresses to a kidney infection and becomes a more serious emergency. (4-6)

**Thus, the ED is a barometer of the status of the medical safety net.** Data on ED use complements other OHREC studies. Using data collected from EDs, we can look at the uninsured as well as those remaining on OHP or commercial insurance, and we can look at larger numbers of patients than is feasible through a survey. ED utilization rates have been adopted by the federal Agency for Healthcare Research and Quality (AHRQ) as a tool for monitoring the safety net. (7, 8)

#### ***WHAT CAN CHANGES IN ED USE TELL US ABOUT ACCESS TO CARE?***

##### ***What if we see an increase in ED utilization rates?***

An increase in overall ED utilization by OHP enrollees, the uninsured, or those with commercial insurance would imply worse access to care outside the ED. As described above, patients lacking access to care come to the ED with preventable emergencies and with primary care treatable illnesses. (4, 5, 9)

##### ***What if we see a decrease in ED utilization rates?***

Although an increase in ED use would suggest worse access to primary care, it is not true that a decrease in ED use definitively demonstrates improved access to care outside of the ED. One component of the OHP cutbacks was implementation of co-payments, including a \$50 co-payment for ED visits. A decrease in ED use could reflect improved access to care outside the ED but – if other evidence failed to suggest improved access – one might conclude that a drop in ED use was caused by the disincentive of the co-payments and not by the attraction of improved primary care access reducing need for EDs. Finding that patients had less use of the EDs without evidence of improved access to primary care outside the ED would be very concerning.

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### ***Can we look at subsets of ED visits?***

One goal of the project was to look separately at preventable emergencies, primary care treatable illnesses, and other subsets of ED visits. Distinguishing “true emergencies” from “minor conditions” is surprisingly difficult. While a diagnosis of heartburn sounds like a minor condition, there is little that a patient can do to distinguish the chest pain of heartburn from the pain of a heart attack until s/he has undergone medical evaluation. Every seasoned emergency physician has treated patients who presented with trivial complaints that turned out to be life-threatening. Attempts by physicians, nurses and others to triage patients with minor problems away from EDs inevitably lead to missing some serious illnesses, sometimes with disastrous consequences. (10-12)

A probability methodology developed by John Billings and colleagues (5, 7, 8) has shown promise for distinguishing primary care treatable ED visits, preventable emergencies, and non-preventable emergencies. We employed this method to try to distinguish these subsets of ED visits.

We also focused on behavioral health ED visits, including drug- and alcohol-related visits as well as other psychiatric conditions. From March 2003 through August 2004, the OHP Standard benefit package dropped coverage for outpatient treatment of drug and alcohol dependence and other psychiatric conditions. We believe this coverage limitation might affect ED use.

Finally, we looked at the proportion of patients admitted to the hospital from the ED, as a measure of the most serious conditions.

### ***What other issues might affect this study?***

This rapid cycle project only covers patients seen in the ED at Oregon Health and Science University (OHSU) immediately following the redesign of the OHP. Other Portland EDs, facilities in other urban communities, and rural EDs may have different patterns of use. Recognizing this limitation, we are collaborating with OHPR to conduct a larger study, of a representative group of EDs statewide. Results of that study are expected in approximately 12 months.

The ideal study would look at *rates* of ED visits. For instance, we would like to know whether an increase or decrease in number of ED visits by uninsured patients is due to a change in the *rate of visits per uninsured person*, or to a change in the *number of uninsured people*. (13) Statewide, there was a drop in OHP enrollment from 429,180 members at the beginning of this study in August 2001 to a low of 398,667 in December 2003, rising to 419,312 at the end of the study in June 2004.

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The proportion of Oregonians without insurance rose from 14.0% in 2002 to 17.0% in 2004. (13) However, accurate data on changes in numbers of uninsured Oregonians and OHP enrollees within the service area of a hospital are not available. We have made an effort to adjust counts of OHP visits by using OMAP's data on enrollees in the region near OHSU. However, we recognize the limitations of this approach because of the many hospitals which patients in this region may choose.

Analyses of subsets of ED visits are only as valid as the methods for determining whether an ED visit should be classified in that subset. The limitations of the Billings methodology are mentioned above. There may be similar problems with the identification of drug- and alcohol-related ED visits, as discussed in Appendix 1.

## **METHODS**

All patients seen in the OHSU ED in August 2001 through February 2003 (before the OHP changes) were compared to all patients seen in March 2003 through June 2004 (after the changes). Because of incomplete diagnosis data prior to March 1, 2002, only patients seen after that date were included in studies of behavioral health utilization. The study compares patterns of ED utilization before versus after the OHP changes, to determine whether there were changes in the diagnostic mix and payer mix of ED patients.

Further details of the methods are provided in Appendix 2.

## RESULTS

*There was a shift in the payer mix with the ED, with a substantial fall in OHP visits and a rise in visits by the uninsured.*

Before March 1, 2003, OHP enrollees made 1,372 ED visits/month at OHSU, falling to 1,063/month afterwards. The uninsured made 657 visits/month before, rising to 738/month afterward (Table 1).

These patterns persist when one examines the percentage of ED visits by payment source. Before March 1, 2003, 38% of ED visits were by OHP beneficiaries, falling to 32% afterward. Visits by the uninsured represented 18% before, rising to 22% afterward, while commercially insured patients accounted for 23% of visits both before and after (Table 1).

Based on data provided by the Office of Medical Assistance Programs, the average number of OHP enrollees in the 4-county area surrounding OHSU fell by 11% between the 8/2001-2/2003 pre-change period and the 3/2003-6/2004 post-change period. The drop in OHP visits remained statistically significant after adjusting for this decrease in OHP enrollees.

<b>Table 1: Payer Mix of OHSU ED Patients Before and After the March 2003 Cutbacks</b>		
	<b>Mean Number of ED Visits/Month (and % of total)</b>	
	<i>Before</i>	<i>After</i>
Commercial	839 (23%)	780 (23%)
OHP	1,372 (38%)	1,063 (32%)*
Uninsured	657 (18%)	738 (22%)*
Medicare	458 (13%)	468 (14%)*
Other	293 (8%)	295 (9%)*
<b>Total</b>	<b>3,619</b> <b>(100%)</b>	<b>3,344</b> <b>(100%)</b>
* p<.05 in comparing the proportion of visits in this payer group before vs. after		

*Behavioral health visits showed dramatic changes. ED use by OHP enrollees for psychiatric conditions fell by 23%, while use by uninsured patients rose by 48%.*

<b>Table 2: Behavioral Health Visits Before and After the March 2003 Cutbacks</b>		
	<b>Mean Number of ED Visits/Month (and % of total)</b>	
	<i>Before</i>	<i>After</i>
<b>Psychiatric</b>		
All payers	159	159
OHP	65 (41%)	50 (31%)*
Uninsured	25 (16%)	37 (23%)*
<b>Alcohol-related</b>		
All payers	57	57
OHP	26 (46%)	18 (32%)*
Uninsured	15 (26%)	21 (37%)*
<b>Drug-related</b>		
All payers	15	15
OHP	8 (55%)	5 (36%)*
Uninsured	4 (27%)	7 (45%)*
* p<.05 in comparing the proportion of visits in this payer group before vs. after		

Before the cutbacks, there were 65 psychiatric ED visits/month by OHP enrollees, falling to 50/month afterwards, although the total number of behavioral health ED visits was unchanged (Table 2). Meanwhile, uninsured psychiatric visits rose from 25/month to 37/month. The numbers of alcohol- and drug-related visits showed similar patterns.

***The Billings methodology for classifying ED visits as primary care treatable, preventable emergencies, or unavoidable emergencies did not yield useful results.***

Although there were small differences between payers (Table 4) and over time (Appendix 4) in the proportions of ED visits that might have been avoided by better access to primary care, neither the pattern of the changes nor the magnitude of the changes appears important from a policy perspective. Given the substantial differences in other measures of ED use in this study and the differences in access to care demonstrated in other OHREC studies, we do not believe that the small magnitude of differences seen here demonstrates lack of real difference between payers, or before versus after the OHP changes. Rather, we conclude that the Billings methodology is insufficiently sensitive to detect these differences.

<b>Billings Categorization</b>	<b>Commercial</b>	<b>OHP</b>	<b>Uninsured</b>
<b>Non-emergency</b>	36%	37%	40%
<b>Emergency, primary care treatable</b>	35%	37%	36%
<b>ED needed, potentially avoidable</b>	9%	9%	9%
<b>ED needed, not preventable</b>	19%	16%	15%

***The proportion of patients admitted to the hospital as a result of their ED visits increased for patients in all payer classes – but most dramatically for the uninsured.***

Overall, 17.9% of ED visits resulted in hospitalizations, compared to 14.2% of OHP-sponsored visits and 7.5% of uninsured visits. The overall percent hospitalized before versus after the OHP cutbacks rose from 16.7% to 19.5%. The 13% increase among OHP patients was similar to the overall increase but the 71% increase among the uninsured was much more dramatic (Table 4).

<b>Payer</b>	<b>Before</b>	<b>After</b>
Commercial	17.0%	20.7%*
OHP	13.6%	15.2%*
Uninsured	5.6%	9.5%*
Medicare	36.8%	38.9%*
<b>Overall</b>	<b>16.7%</b>	<b>19.5%*</b>
* p < 0.05 comparing before vs. after		

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## DISCUSSION / CONCLUSION

After the March 2003 OHP cutbacks, the OHSU emergency department saw a substantial drop in visits by OHP beneficiaries and a rise in visits by the uninsured. Impacts were especially dramatic for behavioral health conditions. Likely policy implications of these findings are as follows:

***Reduced ED use by OHP enrollees could suggest better access to care outside the ED or a success of the co-payment strategy in reducing ED use for low-acuity. However, in the context of other evidence that access has not improved, the reduced ED use probably represents further deterioration of the safety net.***

As mentioned in the Introduction, a drop in ED use could be a signal of increased access to primary care. Interventions that improved access to primary care have led to decreased ED use (14), and ED use has been shown to correlate with other measures of access to care such as provider office hours. (15)

However, in the context of the OHP cutbacks, decreased ED use is likely to represent bad news rather than good. There is no evidence to suggest a recent improvement in access to primary care that would explain the drop in ED use. Therefore, decreased ED use is more likely to represent OHP enrollees' reluctance to risk responsibility for the \$50 co-payment. Were the reduced ED use only for "non-urgent" problems, some policy-makers might accept the reduced access to care as a necessary trade-off in times of fiscal pressure. Co-payments for ED visits may reduce costs without compromising health outcomes in middle-class, commercially insured populations. (16) However, there is evidence that poor patients faced with disincentives to seeking ED care cannot reliably determine whether their care can be deferred safely. (17-19) Vulnerable patients who express willingness to defer their ED visit for several days may have emergency medical conditions (18), and patients who leave an overcrowded ED because of long waits suffer adverse outcomes at a significant rate. (17, 19) Charging \$50 co-payments for ED visits to patients with incomes below 10% of the federal poverty level (2) may be equivalent to cutting another hole in the health care safety net.

***Reduced ED use by OHP enrollees for behavioral health conditions, with a large increase in use by uninsured patients, suggests disproportionate loss of the behavioral health safety net***

The burden of drug-, alcohol-, and psychiatric-related illness increased among uninsured patients visiting the ED after the OHP cutbacks. The reduction in the number of OHP enrollees presenting with behavioral health conditions, coupled with the rise in the number of uninsured patients presenting with these conditions, raises concern that OHP enrollees with behavioral health conditions have left the OHP and substituted ED care for outpatient treatment of their illnesses. Given the high unemployment rate during the time of this study, it is also possible that newly-unemployed Oregonians turned to the ED for

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behavioral health care that they had previously obtained in private settings, finances through their insurance coverage.

***Lack of information from the Billings classification of ED visits as primary-care treatable, avoidable emergencies, and non-avoidable emergencies should not be over-interpreted.***

Policy-makers will want to know which types of ED visits by OHP enrollees dropped in frequency. Were these “minor” problems for which care could be safely omitted? Were they emergencies that could have been avoided with better access to primary care? The Billings classification system holds great promise for answering these questions. The lack of “signal” from this tool is disappointing. Given the large differences in other measures of ED use in this study and the differences in access to care demonstrated in other OHREC studies, we do not believe that the small magnitude of differences seen here demonstrates lack of real difference before versus after the OHP changes.

Another caution is in order regarding interpretation of the Billings guidelines. Some readers, noting the high probabilities of ED visits being “non-emergency” or “emergency/primary care treatable,” may conclude that patients should be discouraged from using the ED for these conditions. However, the Billings tool is designed to retrospectively classify ED visits for research purposes, not to prospectively identify patients who can be triaged out of the ED. Attempts at such triaging have been fraught with problems. Triage mechanisms are surprisingly unreliable at identifying patients in need of hospitalization or life-saving interventions (20-22). Even after patients have been treated in the ED, clinicians reviewing their medical records (23) often disagree about what constitutes an emergency, and objective criteria have not been developed to measure the “appropriateness” of individual ED visits. (10, 11, 24) It is not surprising that attempts to triage “non-urgent” patients away from the ED have resulted in adverse outcomes, including death. (12, 25)

The reasons that the Billings methodology fails to detect the impact of OHP cutbacks are complex and beyond the scope of this report. Other measures of “appropriateness” of ED visits, although initially very promising, have also proven inadequate. (10, 11)

***The increased admission rate for uninsured patients seeking ED care suggests a worsening of health status.***

Although we cannot reliably distinguish “minor” ED visits with the Billings methodology, we can identify a subset of true emergencies – those ED visits leading to hospital admission. Clearly, many true emergencies (fractures, severe asthma attacks, hypoglycemia in diabetics, and symptoms such as chest pain in older adults or high fever in infants, to name a few) do not always require hospital admission, but most ED visits leading to hospitalization are clear-cut emergencies. The observation that uninsured patients seen in the ED are much less likely to be admitted than OHP or commercially insured patients suggests that the uninsured need to use the ED for primary care. The fact

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that – on a percentage basis – OHP hospitalization rates increased after the cutbacks about as much as all other patients implies that their illness severity did not decline. On the other hand, the 71% increase among the uninsured in the proportion of ED visits leading to hospitalization raises concern that these patients, who either lost OHP or commercial insurance or were chronically uninsured, became more likely to defer care until they were severely ill.

***Reduced ED use and fewer patients on the OHP may yield a short-term cost savings for the state. However, the increased burden of uncompensated care will eventually force cost shifting, with resulting increased costs and inefficiencies.***

The large increase in uninsured patients shifts some of the burden of caring for the under-insured from the state to the provider. To a certain extent, this strategy can be effective at reducing public costs. However, hospitals facing a greater burden of uncompensated care will deal with the revenue loss through cost shifting, increasing charges to commercially insured patients. Eventually, the public pays this “tax” through increased insurance premiums. The long-term cost may be greater than a more direct and explicit financing of care through public funds. (26, 27)

In conclusion, these findings, combined with other studies by the OHREC group, point to a worrisome reduction in access to medical care for uninsured Oregonians and OHP enrollees, especially for behavioral health conditions.

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**Appendix 1:**  
**Limitations in Detecting Behavioral Health Conditions from ED Claims Data**

During the study period, there were an average of 57 ED visits/month with alcohol-related diagnoses, 15 visits/month with drug-related diagnoses, and 159 visits/month with other psychiatric diagnoses. The number of patients with other psychiatric diagnoses appears consistent with clinicians' impressions. However, clinicians working in the OHSU ED report that these numbers substantially underestimate the actual numbers of patients with drug- and alcohol-related conditions, and conversations with the staff responsible for diagnostic coding help clarify the discrepancy. Diagnostic coding is performed to justify billing, and chemical dependency is often irrelevant for billing purposes. Therefore, these conditions are under-reported in the billing data.

At least in theory, it is possible that OHP enrollees with behavioral health conditions presented verbalizing non-psychiatric complaints because they knew that psychiatric and substance-abuse problems would not be covered – or that billing staff selected non-psychiatric diagnoses to enhance billing. However, these practices would not explain the observation of increased behavioral health visits by the uninsured. Moreover, coding staff report that they approach all medical records the same, regardless of insurance category, and that their approach has not changed over the study period. Therefore, the proportional changes in patterns of drug- and alcohol-related diagnoses are probably unaffected by the under-reporting of these conditions.

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## **Appendix 2: Detailed Description of Methods for the Project**

### ***Methods***

#### *Overview*

This study used the association between access to primary care and ED utilization to study the impact of OHP changes on access to care. Specifically, the time series study design compares patterns of ED utilization before versus after the OHP changes, to determine whether there were changes in the diagnostic mix and payer mix of ED patients.

#### *Study subjects*

All patients seen in the OHSU ED in August 2001 through February 2003 were compared to all patients seen in March 2003 through June 2004. Because of incomplete diagnosis data prior to March 1, 2002, only patients seen after that date were included in studies of behavioral health utilization.

#### *Key variables*

The predictor variable was whether the ED visit occurred before or after the change in OHP policy.

Each ED visit during the target time periods was evaluated, using computerized billing data from OHSU, to ascertain:

- Payment class
- Presence of specified ICD9 code diagnoses, grouped to represent:
  - Chemical dependency
  - Alcohol-related
  - Other behavioral health diagnoses
- Classification of the visit according to the Billings classification system(5), as probability that the principal diagnoses represented:
  - Not an emergency
  - Emergency, primary care treatable
  - Emergency requiring ED care but potentially preventable or avoidable with reliable access to primary care
  - Emergency, neither primary care-treatable nor preventable

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### *Data analysis*

In addition to simple counts of ED visits, four types of analyses are presented, referred to in this report as follows: payer mix, case mix, pseudo-rates or “rates” and Billings probabilities. **Payer mix** reports describe the proportion of ED visits by patients in each insurance category (for all ED visits or for specific diagnostic categories). These reports reflect the provider’s perspective regarding revenue for emergency department care. **Case-mix** reports describe the proportion of ED visits (overall, or for a specific payer) that fall into a specified set of diagnoses, such as drug-, alcohol-, or behavioral health-related diagnoses.

**Pseudo-rates (“rates”)** represent an attempt to reflect changes in the number of OHP enrollees over time. Monthly data on the number of OHP enrollees in the four counties surrounding OHSU were obtained from the Office of Medical Assistance Programs. Because over 90% of OHP-sponsored visits to the OHSU ED are by residents of these counties, changes in this count of enrollees would reflect a change in the number of OHP beneficiaries “at risk” of using the OHSU ED. “Rates” of ED use were calculated as the number of OHP-sponsored ED visits divided by the number of OHP enrollees in the region. These “rates” must be interpreted with caution. They would only reflect actual rates if OHP enrollees in the region used the OHSU ED as their only source of emergency department care. By neglecting ED visits to other hospitals, these “rates” underestimate the actual ED utilization rates. However, a *change* in these “rates” would reflect a change in the actual rates, as long as the proportion of OHP enrollees selecting OHSU – rather than another ED – remained unchanged over the study time period.

**Billings probabilities** are calculated using previously published methods(5). In brief, Billings and colleagues developed a methodology to categorize ED visits, based on primary ICD9 diagnosis, into the 4 categories described above. After excluding ED visits leading to hospitalization, and ED visits with a principal diagnosis reflecting trauma, drug, alcohol, or psychiatric diagnoses, Billings et al. assigned probabilities that the ED visit represented a nonemergency (a condition such as many cases of contact dermatitis, for which care could have been delayed by 12 hours safely); emergency, primary care treatable (a condition such as many cases of streptococcal pharyngitis, requiring prompt treatment, but with resources typically available in a primary care office); emergency requiring ED care but potentially preventable or avoidable (a condition such as diabetes out of control, needing ED resources, but possibly avoidable with earlier access to primary care); and emergency, neither primary care-treatable nor preventable, such as acute myocardial infarction. Many ICD9 codes map to more than one category; for example, the Billings system may assign a particular ED visit a 50% probability of being a nonemergency, a 25% probability of being an emergency, primary care treatable, and a 25% probability of being an emergency requiring ED care but potentially preventable or avoidable.

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Analyses of payer-mix and case-mix before versus after March 1, 2003, report the “relative risk” (RR). For instance, for a payer-mix analysis, if 20% of ED visits were by OHP beneficiaries after, compared to 10% before, the relative risk would be calculated as  $20\% / 10\% = 2.0$ . Similarly, for a case-mix analysis, if 6% of uninsured patients had psychiatric diagnoses after, compared to 4% before, the relative risk would be calculated as  $6\% / 4\% = 1.5$ . 95% confidence intervals are also presented as a measure of the certainty of our findings. When the 95% confidence interval does not include 1.0, it is generally accepted as unlikely that the observed difference was due to chance alone. (28)

The “pseudo-rates” of ED visits by OHP enrollees were compared before vs. after the cutbacks. A “pseudo-rate” was calculated for each month; then, values before the cutbacks were compared with those after the cutbacks using a t-test. A more complex analysis modeling the exact number of ED visits and their binomial likelihood functions yielded similar results; the t-test results are reported here for simplicity in presentation.

For each ED visit, the Billings algorithm assigns a probability that the visit falls into each of the 4 categories (nonemergency, emergency/primary care treatable, etc.). For each of the 4 Billings categories, a t-test was used to compare the mean probability that ED visits fell into that category before, versus after, the OHP cutbacks, and for other similar comparisons. However, statistical significance of these findings must be distinguished from clinical significance. In some cases, the difference – while unlikely to occur due to chance alone – might be of such a small magnitude as to have minimal clinical or policy importance.

**Appendix 3:  
Changes in ED Algorithm Categorization before Versus After the OHP Cutbacks**

	Mean (Median) Probability that an ED Visit Falls into Each Category							
	Non-emergency		Emergency, primary care treatable		ED needed, potentially avoidable		ED needed, not preventable	
Payer	<i>8/1/2001-2/28/2003</i>	<i>3/1/2003-6/30/2004</i>	<i>8/1/2001-2/28/2003</i>	<i>3/1/2003-6/30/2004</i>	<i>8/1/2001-2/28/2003</i>	<i>3/1/2003-6/30/2004</i>	<i>8/1/2001-2/28/2003</i>	<i>3/1/2003-6/30/2004</i>
Overall	0.39 (0.46)	0.37 (0.43)	0.36 (0.28)	0.36 (0.28)	0.08 (0.00)	0.10 (0.00)	0.17 (0.09)	0.18 (0.10)
Commercial	0.38 (0.43)	0.35 (0.37)	0.35 (0.28)	0.36 (0.28)	0.08 (0.00)	0.09 (0.00)	0.19 (0.11)	0.20 (0.12)
OHP	0.38 (0.43)	0.36 (0.43)	0.37 (0.28)	0.38 (0.30)	0.09 (0.00)	0.10 (0.00)	0.16 (0.09)	0.16 (0.10)
Uninsured	0.42 (0.50)	0.39 (0.46)	0.35 (0.28)	0.36 (0.28)	0.08 (0.00)	0.09 (0.00)	0.15 (0.04)	0.16 (0.05)
Medicare	0.33 (0.09)	0.32 (0.00)	0.34 (0.25)	0.34 (0.28)	0.10 (0.00)	0.11 (0.00)	0.23 (0.12)	0.23 (0.11)

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