

Upcoding in Medicare: Where Does It Matter Most?

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Abstract

Upcoding in Medicare has been a topic of interest to economists and policy makers for nearly 40 years. While upcoding is generally understood as “billing for services at higher level of complexity than the service actually provided or documented,” it has a wide range of definitions within the literature. This is largely because the financial incentives across programs and aspects under the coding control of billing specialists and providers are different, and have evolved substantially over time, as has the published literature. Arguably, the primary importance of analyzing upcoding in different parts of Medicare is to inform policy makers on the magnitude of the process and to suggest approaches to mitigate the level of upcoding. Financial estimates for upcoding in traditional Medicare (Medicare Parts A and B), are highly variable, in part reflecting differences in methodology for each of the services covered. To resolve this variability, we used summaries of audit data from the Comprehensive Error Rate Testing program for the period 2010-2019. This program uses the same methodology across all forms of service in Medicare Parts A and B, allowing direct comparisons of upcoding magnitude. On average, upcoding for hospitalization under Part A represents \$656 million annually (or 0.53% of total Part A annual expenditures) during our sample period, while upcoding for physician services under Part B is \$2.38 billion annually (or 2.43% of Part B annual expenditures). These numbers compare to the recent consistent estimates from multiple different entities putting upcoding in Medicare Part C at \$10-15 billion annually (or approximately 2.8-4.2% of Part C annual expenditures). Upcoding for hospitalization under Medicare Part A is small, relative to overall upcoding expenditures.

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29 1 Introduction

30 Upcoding in Medicare has been a topic of interest to economists and policy makers for nearly 40 years. Upcoding
31 is a term that is not defined in the regulations but is generally understood as “billing for services at a higher level
32 of complexity than the services actually provided or documented.”¹ In fact, its definition in the literature is largely
33 applied by researchers with respect to the specific context of evaluation. Accordingly, the processes and framework
34 for billing and the mechanisms to capture upcoding have changed markedly over the last four decades, as have the
35 establishment and enrollment in different parts of Medicare. These include, but are not limited to, reforms of the
36 Inpatient Prospective Payment System (IPPS), the advent of electronic medical records (EMRs), more rigorous audits
37 of billing records, and the rapidly growing popularity and enrollment in Medicare Part C or Medicare Advantage
38 (MA). Concomitantly the economics literature analyzing upcoding in Medicare has changed in focus, and emphasis.

39 Arguably, the primary importance of analyzing upcoding in different parts of Medicare is to inform policy makers
40 on the magnitude of the process and to suggest approaches to mitigate the level of upcoding. This is not a “one size
41 fits all” undertaking, since the mechanisms for documenting the level of service through preparation of claims varies
42 markedly when Medicare Parts A, B, C and D are compared. They are fundamentally different in terms of the metrics
43 used and measured to determine the magnitude of the claim, a situation which is not typically highlighted in the litera-
44 ture and not oftentimes appreciated. Another reason that could make it hard to provide a unified definition of upcoding
45 across different types of services is due to the conflation of complexity and inefficiency in the delivery of healthcare
46 services. One of the important categories of inefficiency in health care is additional spending on healthcare goods
47 and services that lack evidence of improving health outcomes (Lallemand et al., 2012). Thus, the complexity claimed
48 could arise from inefficient delivery of medical services—such as overuse of diagnostics or overuse of therapeutics
49 with no medical benefit—or inappropriately documented complexity, both being hard to distinguish from one another.
50 Moreover, the extent to which this issue complicates upcoding varies across different types of Medicare services.

51 Taken together, this is precisely why any general extrapolation on the relative importance of upcoding is not pos-
52 sible without using some common metric. The one parameter that can be directly compared is the annual magnitude,
53 in dollars, of upcoding, particularly when expressed as a percentage of total expenditures. While some estimates can

¹See <https://www.cms.gov/files/document/overviewfwacommonfraudtypesfactsheet072616pdf>.

54 be extrapolated from the reports from the Centers for Medicare and Medicaid Services (CMS), to our knowledge,
55 no manuscript in the peer-reviewed literature has done so using data extending over decades, including recent time
56 points. Thus, our paper contributes to the literature by using the data from the Comprehensive Error Rate Testing
57 (CERT) program, which allows for a common approach to identify relative magnitude of upcoding in Medicare Parts
58 A and B. The findings could provide potentially important implication—where attention is needed most to mitigate
59 the level of upcoding.

60 Coding for Medicare Parts A and B is based on services provided to individual patients. Part A services include
61 hospitalization, the largest component, and non-inpatient services, including skilled nursing facility care, and nursing
62 home, home health and hospice care. Coding for each component of Part A services uses a different process, con-
63 founding direct comparisons. Medicare Part B covers physician services, the largest component, and Part B durable
64 medical equipment, prosthetics/orthotics, and supplies (DMEPOS). The parameters and processes for coding and gen-
65 erating claims for each of these services are distinct, making comparisons about the magnitude of upcoding for each
66 difficult at best ([Hsiao, 2022](#)).

67 The literature and focus on upcoding in Medicare has changed dramatically in the last several decades. Initial
68 interest in upcoding, with papers as early as 1985, focused on upcoding for hospital admissions, following introduction
69 of the IPPS in 1983, described in detail later in the paper. Upcoding as applied to hospitalization, was when a provider
70 submitted bills/claims with diagnosis codes for more severe conditions than justified or documented ([Silverman and](#)
71 [Skinner, 2004](#); [Dafny, 2005](#)). Analysis focused on hospital claims for Medicare Part A, in part because enrollment
72 in Medicare Part C was a minor fraction of total Medicare enrollment. As late as 2015, the published literature on
73 upcoding in Medicare was dominated by analyzing this form of overbilling.

74 Other forms of overpayment are sometimes conflated with upcoding because they are not predicated on incorrect
75 or inadequate documentation ([Beaton, 2017](#)). These include billing for services not performed at all, unnecessary
76 admissions, illegal referrals or kickbacks, and prescribing excessive tests or conducting excessive care. Billing for
77 services not performed at all, and illegal referrals or kickbacks, are outright fraud. Unnecessary admissions are not a
78 consequence of incorrect codes, but rather a decision on where the services are conducted. Prescribing excessive tests
79 or conducting excessive care is typically used to either substantiate a diagnosis or rule out alternative diagnoses, and

80 as such is neither incorrect or inadequate documentation, although in selected cases may be considered upcoding by
81 CMS.² Note that the overuse of medical services could result in overpayments, but it is primarily due to inefficiency,
82 rather than complexity in medical conditions, reflecting the conflation of inefficiency and under-evidenced complexity
83 we mentioned above.

84 With implementation of the IPPS by Medicare in 1983, each admission is assigned a diagnosis-related group
85 (DRG) code, based on a diagnosis or procedure. Coding for IPPS is typically based on the discharge summary. This
86 is a description of the hospital admission, that includes a list of the primary and secondary diagnoses, procedures,
87 a narrative account of the hospital course including the reason for admission, discharge medications, and ancillary
88 data such as laboratory values, imaging results, notes from consulting services, and more. Typically, medical coders
89 “select” a base DRG from the list of diagnoses/procedures in the discharge summary. A base DRG records the patient’s
90 primary diagnosis or procedure.

91 Often, several DRGs share a common base DRG. For instance, DRGs 637 — 639 are “Diabetes with major
92 complication or comorbidity (MCC),” “Diabetes with complication or comorbidity (CC),” and “Diabetes without
93 CC/MCC,” respectively. All three belong to the same base DRG – diabetes. The base DRG can be modified depending
94 on the presence or absence of a CC or MCC, which increases the weight of the DRG and hence the reimbursement.
95 Justification for selecting a specific base DRG, with or without a CC or MCC, depends on appropriate and adequate
96 documentation.

97 The following are processes that constitute upcoding for IPPS and are the source for scrutiny by auditors: (1)
98 selecting a base DRG with a higher weight than justified, (2) coding a CC or MCC modifying the base diagnosis that
99 is not present/not sufficiently documented, (3) coding selected diagnoses as present on admission when they were not,
100 and (4) unbundling services/procedures that are bundled under a single DRG. When any of these is done intentionally,
101 it is fraud, and results in substantial financial penalties, sanctions, and even imprisonment. If unintentional, or inadver-
102 tent, and if upheld on appeal, Medicare recoups the overpayment. While the consequence is that hospitals, providers
103 and coders are highly attuned to the implications of improper coding, this does not preclude doing so if the incentives
104 are sufficient.

105 Importantly, upcoding for inpatient care under Medicare Part A is based on documentation of acute events precipi-

²For instance, see <https://www.ama-assn.org/system/files/issue-brief-cms-modifier-25.pdf>.

106 tating admission, rather than on chronic conditions of the sort contributing to Hierarchical Condition Category (HCC)
107 scores for MA plans, as discussed further below. This was the primary consequence and intent of the Medicare reform
108 in 2007-2008. Prior to that reform, many common chronic conditions in an individual patient, such as diabetes (a con-
109 tributor to the HCC score for MA plans), and in which details and documentation of acute problems were not specified,
110 would increase DRG-based reimbursement. Following the reform, only documentation of some acute manifestation
111 (such as gangrene in a foot ulcer in patients with diabetes) would lead to higher DRG-based reimbursements ([Office
112 of the Federal Register and National Archives and Records Service, 2007](#)).

113 The magnitude of upcoding for inpatient admissions under Medicare Part A has only been estimated in a limited
114 number of papers ([Dafny, 2005](#); [Cook and Averett, 2020](#); [Ganju et al., 2022](#); [Gowrisankaran et al., 2022](#)). [Dafny
115 \(2005\)](#) estimated that the annual payments increased by \$330-425 million due to a policy of code change in 1988, or
116 approximately 0.6% of the hospital PPS expenditures in 2000. [Cook and Averett \(2020\)](#) concluded that an additional
117 3% in reimbursements could be associated with upcoding during the period following the 2007 reform, although the
118 possibility that increased reimbursements reflected more accurate coding was not addressed. This is an important
119 distinction, because the 2007 reform required increased effort on documentation to justify CCs and MCCs. In this
120 regard, [Gowrisankaran et al. \(2022\)](#) found negligible evidence of upcoding following the reform, but found that re-
121 imbursements in Medicare Part A could increase by 0.8% given a unit change in DRG weights before the reform,
122 which is in line with [Dafny \(2005\)](#). Importantly, [Gowrisankaran et al. \(2022\)](#) concluded that more accurate coding
123 rather than upcoding explained an increase of \$1.08 billion following the reform, or 0.86% of the total hospital IPPS
124 expenditures. [Ganju et al. \(2022\)](#) considered the effects of auditing as a strategy to identify upcoding and suggested
125 that the implementation of the recovery audit program saved approximately 0.80 % of (or \$1 billion in) Medicare
126 reimbursements. Each of these studies identifies upcoding using different methodologies to compare DRG weights for
127 specific conditions, without any direct comparison for entire populations as possible with MA, as explained below.

128 Coding for skilled nursing facility care, nursing home care, home health care, and hospice care, covered under
129 Part A non-IPPS, is not dependent on the diagnosis, but rather on the level of services provided and resources used.
130 Reimbursement can be fee for service (FFS) or per diem, but in either case upcoding reflects inadequate/fraudulent
131 documentation of the services delivered ([Bowblis and Brunt, 2014](#)).³

³Note that complexity of care under Part A non-IPPS is defined in a similar way to that in Part B, or Part C non-hospitalizations. Thus, it could

132 Upcoding for physician services through Medicare Part B occurs when the provider submits claims for a more
133 complex set of services provided than justified, independent of the diagnosis. The majority of these Part B claims are
134 for ambulatory visits, where claims are prepared using evaluation and management (E&M) codes. Until recently, there
135 were 5 levels of service for new patient visits, and an analogous set of 5 levels for established patient visits. Coding
136 was dependent on the level of documentation of history, physical, laboratory data, and management plan, or on time
137 spent in specific elements of the visit, using the assumption that provider effort (time) was proportionate to the level
138 of documentation. Claims can now be coded solely based on the time for the visit, or on medical decision making,
139 with only four levels for new or established patients (Millette, 2020). Studies looking at upcoding for physician
140 services have evaluated the distribution of levels service for similar populations of patients before and after changes
141 in the reimbursement weights, at the frequency with which some providers use only the highest E&M codes, or at
142 the plausibility of time-based codes (Brunt, 2011; Fang and Gong, 2017; Loria, 2018). In other words, just as for
143 studies quantifying upcoding for Medicare Part A, the methodologies are substantially different, confounding direct
144 comparisons. Moreover, it is even harder to identify whether the inflated complexity, if any in the bill, is due to the
145 inefficiency in delivering healthcare services or inappropriate documentation, given that the reported complexity is
146 mainly based on providers' time and efforts.

147 Part B DMEPOS covers a wide range of items. Devices for improving respiratory function, equipment to assist
148 with ambulation, infusion equipment and nerve stimulators for pain modulation. In order, the three most widely
149 prescribed are continuous positive airway pressure devices, crutches, and humidifiers. Coding claims for these items
150 is dependent on both the diagnosis and justification for need. Upcoding is most commonly based on inadequate or
151 fraudulent documentation of need.

152 An increasing attention has been focused on upcoding for Medicare Part C, or Medicare Advantage (Geruso and
153 Layton, 2020; Gilfillan and Berwick, 2021; Hostetter and Klein, 2022), but the recognition of overpayments to MA
154 plans is not new, going back more than 20 years (Angeles and Park, 2009). Overpayments are estimated by comparing
155 the expenditures for equivalent levels of service across large populations in MA and traditional Medicare Parts A and
156 B, which cover the same services. Estimates have consistently been in the range of 10-14% greater reimbursements for

also be challenging to separate under-evidenced complexity from the inefficiency in the provision of care. The method we use in this paper helps identify the relative magnitude of upcoding in different types of Medicare services but also highlights the challenge to combat upcoding in services other than Part A hospitalization care.

157 MA. In MA, insurance companies assume the financial risk for providing healthcare for a population of patients who
158 enroll with them for Medicare coverage. The allocation from CMS to private insurers administering MA plans is based
159 on the aggregate Hierarchical Condition Category (HCC) score for the population, derived from the accumulation of
160 chronic conditions for all individuals covered by the plan. The HCC score is intended to capture the costs of all
161 patient care over a year-long period (Yeatts and Sangvai, 2016). This approach is needed to adequately risk adjust the
162 payments, and preclude “cherry-picking” of healthier patients by the plans. The capitated payment to the MA plan,
163 covering the population of enrolled payments, is then used to reimburse for individual patients’ services, including
164 inpatient admissions and outpatient care.

165 Upcoding for MA reflects excessive or even fraudulent documentation of underlying chronic health conditions
166 for any given individual. This can occur through a number of mechanisms, involving both providers and private
167 insurers. When this occurs for a substantial number of individuals covered by any MA plan, the greater the capitated
168 reimbursement from Medicare. Reviews of fraud lawsuits, inspector general audits, and watchdog investigations,
169 detailed how the majority of large health insurers used this mechanism to expand profits. The estimated amount of
170 payments associated with MA upcoding varies, depending upon the methodology, but is in the range of \$9–12 billion
171 on an annual basis over the last decade (Angeles and Park, 2009; MedPAC, 2018; Geruso and Layton, 2020). For
172 instance, according to the report to the Congress by the Medicare Payment Advisory Commission, the higher coding
173 intensity in MA plans could have resulted in at least \$12 billion, and as much as \$25 billion, in excess payments to
174 MA plans in recent years (MedPAC, 2022). In the final rule on MA overpayments, published in the Federal Register
175 on February 1, 2023, CMS estimated that in Fiscal Year (FY) 2021 alone, over \$15 billion in Part C overpayments
176 were made, representing 4.2% of total Part C payments.⁴ These estimates tend to be internally consistent because the
177 process used in the calculation is based on comparisons of total spending across whole populations, rather than on the
178 range or specifics of services provided to individual patients. This is in contrast to the situation with Medicare Parts A
179 and B, where the methodology is variable when different papers are compared. That is our logic for using a common
180 methodology when analyzing upcoding in traditional Medicare Parts A and B, and one that provides the most accurate
181 account of the financial magnitude of upcoding.

⁴Note that the FY is the accounting period for the federal government, from the fourth quarter of the previous year to the third quarter of the current year.

2 Comparing upcoding for Part A and Part B services – the the Comprehensive Error Rate Testing Program

As explained above, the processes and mechanisms for upcoding the various services under Medicare Parts A and B vary widely. Upcoding can reflect incorrect/fraudulent diagnosis codes, provider effort independent of diagnosis, resources utilized, or justification of need. Estimates for the financial magnitude of each, let alone a comparison across services, are problematic. This is in the face of a predominant emphasis in the economic literature on upcoding in Part A.

We have utilized recently available reports summarizing the findings from the CERT program to circumvent this issue. Medicare uses and has used a variety of auditing strategies to evaluate the rate of improper payments. The only one that selects claims for auditing on a purely *random* basis is the CERT program. The other programs depend on algorithms that identify outliers to trigger a review, such as a substantial increase in the number of submitted claims or for a specific DRG from a single organization, or a red flag from the CERT program. According to CMS, an improper payment is defined as “any payment that should not have been made or that was made in an incorrect amount (including overpayments and underpayments) under statutory, contractual, administrative, or other legally applicable requirements” (CERT Program, 2020). The fact that CERT audits are performed on a random sample of Medicare claims is essential to the results we present and to our conclusions. Using results from other audits would not represent the overall prevalence of improper bills, since they constitute a pre-selected subset flagged to trigger reviews. The CERT program selects at random approximately 50,000 claims from those submitted to Medicare during a reporting period. The CERT review contractor sends a request to the provider requesting that medical documentation be submitted for CERT review. CERT auditors review them and identify categories of improper payments. They neither have responsibility or authority to levy fines, nor do they negotiate with hospitals regarding the results of their reviews. The information gathered by a CERT contractor is also used to improve system edits, update coverage policies and manuals and conduct provider education efforts.

Claims are analyzed separately for Medicare Part A IPPS, Part A non-IPPS, Medicare Part B, and Part B DMEPOS. Claims are categorized as either proper payments or into one of five improper payment types: Medical necessity,

207 no documentation, insufficient documentation, incorrect coding or other, using the stratification below. Of central
208 importance, CMS emphasizes that improper billing falling under any of these categories should not necessarily be
209 considered fraud.

- 210 • Medical necessity — The DRG diagnosis/procedure is for a service that should be carried out in an ambulatory
211 setting rather than as inpatient.
- 212 • No documentation — The provider either fails on repeated requests to provide the medical records, or indicates
213 they do not have the documentation.
- 214 • Insufficient documentation — Medical documentation is not adequate to justify that the services were provided.
215 Specific required documentation elements that are missing, such as a physician signature, also place the claims
216 in this category.
- 217 • Incorrect Coding — Documentation provided indicates that the wrong code was entered, the service was unbun-
218 dled, or the wrong billing provider or site was listed.
- 219 • Other — A wide array of miscellaneous causes for improper bills.

220 **2.1 Improper payment errors in Part A IPPS**

221 We first present the improper payment rates for Part A IPPS in 2010-2019 for different error types in Table 1 using
222 summaries of results reported by the CERT program. As mentioned above, the category of improper payments cover
223 any payment that was incorrect for any reason. They are not tantamount to fraud, and capture errors in across multiple
224 categories, many of which are simple errors of omission. In the large majority of cases, improper bills regardless of
225 the category are resolved by the claims adjudication, limiting the magnitude of any financial losses to the Medicare
226 program.

227 The improper payment rate for a particular category is equal to the proportion of improper payments for that
228 category to the total payments, with some weighting applied. Note that the sample is projected to the universe sta-
229 tistically using a combination of the sampling weight and the relative share of universe expenditures (Supplementary
230 Appendices, [CERT Program](#), 2015).

231 In all the years, the largest category is medical necessity (range 2.28% to 9.39%), followed by incorrect coding
 232 (range 0.55% to 1.94%) and insufficient documentation (range 0.43% to 1.14%).

Table 1: Error type distribution (%) in Part A IPPS

Fiscal Year	Incorrect coding	Insufficient documentation	Medical necessity	No documentation	Other	Total
2010	1.04	1.14	7.28	0.12	0.03	9.60
2011	1.14	1.14	6.86	0.11	0.04	9.30
2012	1.87	0.90	7.03	0.00	0.09	9.89
2013	1.94	0.71	9.39	0.02	0.13	12.20
2014	1.16	1.09	5.08	0.00	0.07	7.40
2015	0.90	0.43	2.97	0.03	0.18	4.50
2016	1.43	0.44	2.45	0.01	0.07	4.40
2017	0.76	1.08	2.78	0.08	0.11	4.80
2018	0.78	0.88	2.48	0.04	0.02	4.20
2019	0.55	1.04	2.28	0.02	0.11	4.00

SOURCE: The reported improper payment rates in Part A IPPS in Medicare FFS Improper Payments Reports 2011 – 2020 (CERT Program, 2011 – CERT Program, 2020).

233 Given the above, Table 1 suggests that the largest contributor to improper bills through IPPS arises from medical
 234 necessity, a type of improper billing that is more about where the medical service should be performed than incom-
 235 plete or fraudulent documentation of the diagnosis or service level provided. In fact, there is a dramatic decrease in
 236 medical necessity as a cause of improper claims, between 2014 and 2015. The most likely explanation relates to the
 237 implementation of the “two-midnight rule.” CMS has recognized an increasing number of patients being observed for
 238 extended stays in an outpatient setting (primarily observational units linked to emergency departments), with variabil-
 239 ity around the justification for an inpatient admission under IPPS. Therefore, CMS adopted the “two-midnight rule”
 240 in FY 2014, clarifying when inpatient hospital admissions are generally appropriate for Medicare Part A payments.
 241 According to this rule, inpatient admissions will generally be payable under Part A if the admitting practitioner ex-
 242 pects the patient to require a hospital stay that crosses two midnights and the medical record supports that reasonable
 243 expectation. Clarification was accompanied with a 72% decline in the fraction of IPPS claims considered improper
 244 due to medical necessity (CERT Program, 2015). This sequence is highly illustrative: Improper bills seem to reflect
 245 changes in medical practice coupled with the complexity of coding, and not fraud.

246 **2.2 Improper payment errors in Part B Physician services**

247 Total improper payment rates for Part B physician services average 10.5% over the period from 2010-2019 (Table
248 2). The most common reason for improper billing for Part B physician services is insufficient documentation. As
249 explained above, coding is based on estimates of provider effort, independent of diagnosis.

Table 2: Error type distribution (%) in Part B

Fiscal Year	Incorrect coding	Insufficient documentation	Medical necessity	No documentation	Other	Total
2010	2.95	6.52	0.36	0.65	0.01	10.49
2011	2.97	6.11	0.31	0.48	0.03	9.89
2012	2.70	6.88	0.38	0.45	0.09	10.50
2013	3.16	8.24	0.27	0.21	0.23	12.10
2014	3.12	8.66	0.22	0.48	0.22	12.70
2015	2.96	7.98	0.26	0.39	0.12	11.70
2016	2.76	6.69	0.35	0.31	0.09	10.20
2017	2.53	6.98	0.33	0.36	0.50	10.70
2018	2.58	5.27	0.27	0.37	0.11	8.60
2019	1.75	5.52	0.15	0.49	0.19	8.11

SOURCE: The reported improper payment rates in Part B IPPS in Medicare FFS Improper Payments Reports 2011 – 2020 (CERT Program, 2011 – CERT Program, 2020).

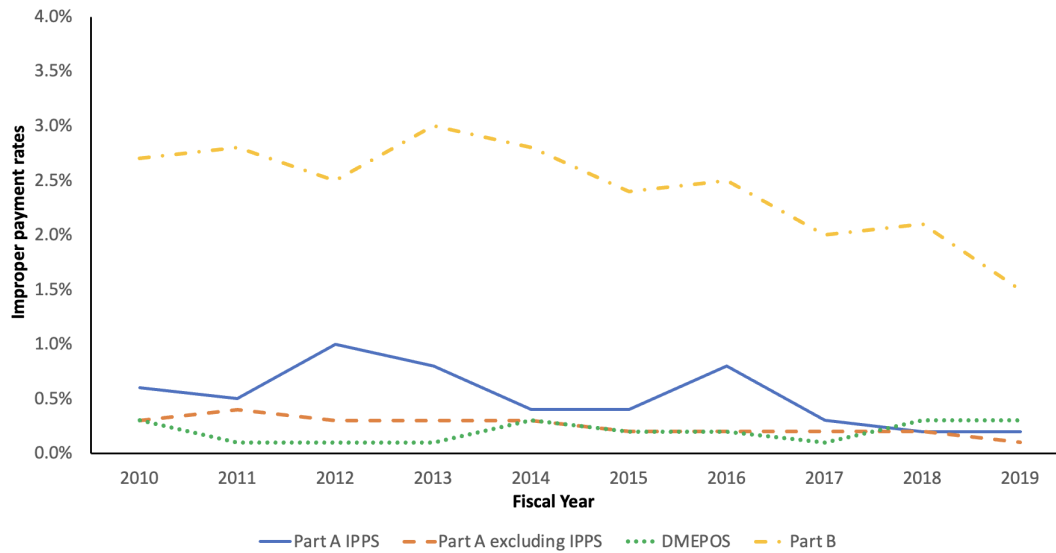
250 We also provide the overall improper payment rates for other services in Medicare Parts A and B in Appendix
251 Table A1.

252 **2.3 Financial consequence of upcoding**

253 Up to this point, we have explained the process by which upcoding could occur with claims submitted to CMS for
254 hospitalization and physician services, and have shown the breakdown by category of improper claims. This informa-
255 tion does not provide a direct assessment of the magnitude of upcoding. For example, upcoding for IPPS would most
256 commonly reflect preferential selection of DRG codes with higher weights. This can result either from (incorrect)
257 selection of base DRGs with higher weights than the correct base DRG, or from coding higher pay DRGs (those with
258 CCs or MCCs), when CCs or MCCs are not present, or from unbundling services that are included under a single
259 DRG. These distinctions cannot be made from improper payment rates, since as stated earlier, improper payments are
260 not necessarily tantamount to fraud.

261 To determine the magnitude of upcoding, we use the data summarized in the CERT report provided by CMS on

Figure 1: Improper payment rates due to *upcoding* by claim types



262 upcoding specifically for IPPS and other components of Medicare Part A and B. Figure 1 depicts the reported improper
 263 payment rates due to upcoding during the sample period, separately for each claim type. Upcoding constitutes 1% or
 264 less (average of 0.53%) of total reimbursements for IPPS over the period from 2010-2019. On average, the projected
 265 improper payment associated with IPPS upcoding is \$656 million per year.⁵ Of particular importance, other processes
 266 account for 75-95% of improper bills for IPPS (Compare IPPS in Figure 1 and the last column of Table 1). Specifically,
 267 the large majority of the financial costs of improper billing are for medically unnecessary admissions (Table 1).

268 According to the summary reports from the CERT program, the average projected amount associated with upcod-
 269 ing for physician services under Part B is \$2.38 billion per year (or 2.43% of Part B annual expenditures). Upcoding
 270 percentages for Part A non-IPPS and Part B DMEPOS is less than 0.27% on average, and together accounts for only
 271 \$447 million annually.

272 3 Discussion and conclusion

273 Our results allow direct comparison of improper payment rates and upcoding for all components of Medicare Parts A
 274 and B. These can be expressed as a percentage of claims between the various services, and by the financial impact.

⁵We deflate the dollar amounts in different years using the corresponding Medicare Economic Index to make sure the amounts across different years are comparable. We do this for all the average payment amounts discussed in this paper. We obtain the Medicare Economic Index from CMS (<https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/medicareprogramratesats/marketbasketdata>).

275 The estimated combined financial impact of upcoding, on average over the period 2010-2019, is approximately \$3.48
276 billion per year, predominantly due to upcoding in Medicare Part B. This value is substantially lower than the estimates
277 of \$9-12 billion for years for MA. Although differences in methodology preclude direct comparisons, it is nonetheless
278 likely that upcoding for Parts A and B has a smaller financial impact than for MA.

279 According to CERT reports, the annual projected amount from Part A IPPS upcoding is \$656 million (0.17% of
280 total Medicare Parts A and B expenditures).⁶ In combination, these data suggest upcoding of hospital admissions is
281 minor in frequency and in financial impact compared to the totality of other concerns. We believe that more stringent
282 regulatory initiatives starting in 1996, reforms of the DRG system, and widespread adoption of EMRs, could contribute
283 to the low incidence of upcoding in Part A hospital inpatient care.

284 Note that it is likely that the CERT program does not detect all upcoding in practice, but neither does it detect all
285 other forms of improper billing. The focus on our paper is not the precise incidence, prevalence or financial impact
286 of upcoding for hospital admissions or other services covered by Medicare Parts A and B, but rather the *relative*
287 contribution of each to the overall universe of improper billing, and upcoding. There is no reason to assume that there
288 is preferential attention to one explanation for improper billing by CERT auditors, nor that upcoding is more difficult
289 to identify than other forms of improper billing. In fact, medical necessity is the category with the most ambiguity,
290 given the complexity of the clinical situation leading to the decision to admit a patient to the hospital.

291 CMS advises very directly that the CERT data cannot be used as an indication of fraud. The data does not distin-
292 guish between intentional and unintentional upcoding, the latter of which may result in payment adjustments, but not
293 in prosecutions. It is out of the scope of this study to respectively characterize “incidental” upcoding and “intentional”
294 upcoding—both of them lead to additional financial expenses. Nor is it within the scope of this paper to differentiate
295 between other forms of incidental vs intentional improper billing, all of which lead to additional financial expenses. In
296 the large majority of cases, improper bills regardless of the category are resolved by the claims adjudication, limiting
297 the magnitude of any financial losses to the Medicare program.

298 There are a few caveats to our study. First of all, we base our primary analysis on the CERT data. The results could
299 be biased if the sample is poorly constructed or the incentives of auditors are misaligned. We do not view both cases as
300 substantial concerns because CMS has been using the current strategy for sample selection since 2012 (the time period

⁶On average, the total expenditures on Medicare Parts A and B are \$388 billion per year between 2010 and 2019.

301 of our study). While we do not obtain much information on the payment schemes for CERT auditors, we believe that
302 they tend to review claims rigorously as they are independent auditors that neither have responsibility nor rights to
303 levy fines from hospitals, nor do they interact directly with hospital personnel. Moreover, CMS uses the result from
304 CERT in a wide range of settings to improve the reimbursement schemes and policies, not simply to identify improper
305 bills. Finally, it is likely that the CERT auditors may not capture every instance of upcoding. However, our paper
306 focuses on the relative contribution of upcoding from different components in Medicare Parts A and B services to the
307 overall universe of improper billing, which we show is quite low for Medicare Part A IPPS. Based on our results, the
308 current regulatory processes to minimize upcoding for hospital admissions under Part A IPPS are highly effective. To
309 further mitigate the problem of upcoding in other parts of Medicare services, it would be important to first address the
310 challenge of the conflation between under-evidenced complexity and inefficiency in healthcare delivery.

311 **List of abbreviations**

- 312 1. IPPS – Inpatient Prospective Payment System
- 313 2. EMR – electronic medical record
- 314 3. MA – Medicare Advantage
- 315 4. CMS – Centers for Medicare & Medicaid Services
- 316 5. DMEPOS – durable medical equipment, prosthetics/orthotics, and supplies
- 317 6. DRG – diagnosis-related group
- 318 7. MCC – major complication or comorbidity
- 319 8. CC – complication or comorbidity
- 320 9. HCC – Hierarchical Condition Category
- 321 10. FFS – fee for service
- 322 11. E&M – evaluation and management
- 323 12. FY – Fiscal Year
- 324 13. CERT – Comprehensive Error Rate Testing

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Table A1: Total improper payment rate (%) in other Parts A and B services

Fiscal Year	Part A non-IPPS	Part B DMEPOS
2010	5.10	67.4
2011	4.80	66.0
2012	8.20	58.2
2013	13.1	53.1
2014	14.7	39.9
2015	14.0	46.3
2016	11.3	44.6
2017	8.10	35.5
2018	8.10	30.7
2019	6.20	31.8

Note: Data directly obtained from the reported improper payment rates for these services in Medicare FFS Improper Payments Reports 2011 – 2020 ([CERT Program, 2011](#) – [CERT Program, 2020](#)).