

Medicare pcp spend

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import Medicare Provider Utilization and Payment Data: Physician and Other Supplier PUF CY2017

```
setwd("~/")
# from: https://data.cms.gov/Medicare-Physician-Supplier/Medicare-Provider-Utilization-and-Payment-Data
dat <- read_csv("https://data.cms.gov/api/views/fs4p-t5eq/rows.csv?accessType=DOWNLOAD")

## Parsed with column specification:
## cols(
##   .default = col_character(),
##   `National Provider Identifier` = col_double(),
##   `Number of Services` = col_double(),
##   `Number of Medicare Beneficiaries` = col_double(),
##   `Number of Distinct Medicare Beneficiary/Per Day Services` = col_double(),
##   `Average Medicare Allowed Amount` = col_double(),
##   `Average Submitted Charge Amount` = col_double(),
##   `Average Medicare Payment Amount` = col_double(),
##   `Average Medicare Standardized Amount` = col_double()
## )

## See spec(...) for full column specifications.
```

parse MCare visits/PCP/year by CPT

```
dat_sub = dat %>%
  select("HCPCS Code", "Number of Services", "Provider Type", "Average Medicare Allowed Amount")

dat_sub = dat_sub[dat_sub$`Provider Type`=="General Practice" | dat_sub$`Provider Type`=="Internal Medicine"]

dat_sub = dat_sub[dat_sub$`HCPCS Code`=="99201" | dat_sub$`HCPCS Code`=="99202" | dat_sub$`HCPCS Code`=="99203"]

visit_freq = dat_sub %>%
  group_by(`HCPCS Code`) %>%
  summarise(nmcare = mean(`Number of Services`),
            nmcarelo = quantile(`Number of Services`,c(.025)),
            nmcarehi = quantile(`Number of Services`,c(.975)))
visit_freq$`HCPCS Code` = as.numeric(visit_freq$`HCPCS Code`)
```

import old and new Medicare funding by CPT code

```
hcpcscodes = c(99201,
               99202,
               99203,
               99204,
               99205,
```

```

99211,
99212,
99213,
99214,
99215)

rates2019 = c( 46.49,
  77.48 ,
  109.92 ,
  166.86 ,
  209.75 ,
  23.07 ,
  45.77 ,
  75.32 ,
  110.28 ,
  147.76 )

rates2021 = c(0,
  77.48,
  116.41,
  172.99,
  221.64,
  23.07,
  48.65,
  87.21,
  121.45,
  172.63)

rates_old <- data.frame(hcpcscodes,rates2019)
rates_new <- data.frame(hcpcscodes,rates2021)

names(rates_old)=c("HCPCS Code","Rate")
names(rates_new)=c("HCPCS Code","Rate")

```

calculate difference in gross revenue per PCP per yr

```

rev_old = visit_freq %>%
  full_join(rates_old) %>%
  select(`HCPCS Code`, nmcare,nmcarelo,nmcarehi, Rate) %>%
  mutate(rev = nmcare * Rate,
         revlo = nmcarelo * Rate,
         revhi = nmcarehi * Rate)

## Joining, by = "HCPCS Code"

revold = sum(na.omit(rev_old$rev))
revoldlo = sum(na.omit(rev_old$revlo))
revoldhi = sum(na.omit(rev_old$revhi))

rev_new = visit_freq %>%
  full_join(rates_new) %>%
  select(`HCPCS Code`, nmcare,nmcarelo,nmcarehi, Rate) %>%
  mutate(rev = nmcare * Rate,
         revlo = nmcarelo * Rate,

```

```

    revhi = nmcarehi * Rate)

## Joining, by = "HCPSC Code"
revnew = sum(na.omit(rev_new$rev))
revnewlo = sum(na.omit(rev_new$revlo))
revnewhi = sum(na.omit(rev_new$revhi))

revdiff = revnew - revold
revdifflo = revnewlo - revoldlo
revdiffhi = revnewhi - revoldhi

revdiff

## [1] 8535.466
revdifflo

## [1] 445.41
revdiffhi

## [1] 39258.17

```

change in primary care spending

```

# total new Mcare spending due to 2021 rule
dat_sub = dat %>%
  select("HCPSC Code", "Number of Services", "Provider Type", "Average Medicare Allowed Amount")

dat_sub = dat_sub[dat_sub$`Provider Type`=="General Practice" | dat_sub$`Provider Type`=="Internal Medicine"]

payments_old = dat_sub %>%
  summarise(ntotpay_pc = sum((`Average Medicare Allowed Amount`)*(`Number of Services`)))

# face validity: primary care as proportion of total Medicare spend, versus 2% estimate from Milbank:
# 705.9 stat from: https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports
# 2% estimate from: https://www.milbank.org/programs/primary-care-spend/other-resources/
payments_old/(705.9*10^9)

##    ntotpay_pc
## 1 0.02490718

dat_sub$`HCPSC Code` = as.numeric(dat_sub$`HCPSC Code`)

## Warning: NAs introduced by coercion
payments_new_pre = dat_sub %>%
  left_join(rev_new) %>%
  mutate(Rate = replace_na(Rate, 0))

## Joining, by = "HCPSC Code"
payments_new_pre$newrate = rowMaxs(cbind(payments_new_pre$Rate, payments_new_pre$`Average Medicare Allowed Amount`))

payments_new = payments_new_pre %>%
  summarise(ntotpay_pc = sum(newrate*(`Number of Services`)))

payments_new/(705.9*10^9)

```

```
##   ntotpay_pc
## 1 0.02674235
```

time savings from reduced documentation

```
set.seed(100)
prop_mcare = runif(10000,.049,.667)

# in minutes, from doi: 10.1377/hlthaff.2016.0811
note_time_per_day_invisit = rnorm(10000,1.33,.86/sqrt(471))*60*prop_mcare
note_time_per_day_outvisit = rnorm(10000,0.52,.72/sqrt(471))*60*prop_mcare
note_time_per_day_athome = rnorm(10000,0.13+0.11, (.37+.36)/sqrt(471))*60*prop_mcare

visits_per_day = rnorm(10000,12.3,5.3/sqrt(471))

note_time_per_visit_invisit = note_time_per_day_invisit/visits_per_day
note_time_per_visit_outvisit = note_time_per_day_outvisit/visits_per_day
note_time_per_visit_athome = note_time_per_day_athome/visits_per_day

time_saved_per_day_invisit = note_time_per_visit_invisit/3* visits_per_day
time_saved_per_day_outvisit = note_time_per_visit_outvisit/3* visits_per_day
time_saved_per_day_athome = note_time_per_visit_athome/3* visits_per_day

mean(time_saved_per_day_invisit)

## [1] 9.525379
quantile(time_saved_per_day_invisit,c(.025,.975))

##      2.5%      97.5%
## 1.722103 17.427831
mean(time_saved_per_day_outvisit)

## [1] 3.72484
quantile(time_saved_per_day_outvisit,c(.025,.975))

##      2.5%      97.5%
## 0.6713466 6.9505883
mean(time_saved_per_day_athome)

## [1] 1.719544
quantile(time_saved_per_day_athome,c(.025,.975))

##      2.5%      97.5%
## 0.3073647 3.4460506
mean(time_saved_per_day_invisit)+mean(time_saved_per_day_outvisit)+mean(time_saved_per_day_athome)

## [1] 14.96976
quantile((time_saved_per_day_invisit)+(time_saved_per_day_outvisit)+(time_saved_per_day_athome),c(.025,

##      2.5%      97.5%
```

```
## 2.71032 27.39217
```

other insurers follow

sum Medicare fees per physician subtract out the other revenue then increase the diff by same relative proportion add back to new medicare fees compare before and after total reve per fte md

```
mcare_tot_per_fte = dat %>%
  select(`National Provider Identifier`, `Average Medicare Allowed Amount`, `Number of Services`) %>%
  group_by(`National Provider Identifier`) %>%
  summarise(totmcareperfte = sum(`Average Medicare Allowed Amount` * `Number of Services`))

# MGMA: FFS revenue per MD FTE: mean 638,634; se = 481,774/sqrt(1325), IQR: $378,463 , $765,092
set.seed(100)
totrev_per_fte = rnorm(length(mcare_tot_per_fte$totmcareperfte), 638634, mean(c((638634-378463)/1.96, (765092+378463)/1.96)))
totrev_per_fte[totrev_per_fte<0] = mean(totrev_per_fte)

otherrev_tot_per_fte = totrev_per_fte - mcare_tot_per_fte$totmcareperfte
otherrev_tot_per_fte[otherrev_tot_per_fte<0] = mean(otherrev_tot_per_fte)

new_otherrev_tot_per_fte = mean(rates2021[2:10]/rates2019[2:10])*otherrev_tot_per_fte
mean(new_otherrev_tot_per_fte - otherrev_tot_per_fte + revdiff)
```

```
## [1] 49088.58
```

```
quantile((new_otherrev_tot_per_fte - otherrev_tot_per_fte+revdiff), c(.025, .975))
```

```
## 2.5% 97.5%
```

```
## 21024.79 74056.09
```

```
denominator = (otherrev_tot_per_fte+mcare_tot_per_fte$totmcareperfte)/.056 # https://www.pcpcc.org/site
```

```
new_mcare_tot_per_fte = dat %>%
  select(`National Provider Identifier`, `Average Medicare Allowed Amount`, `Number of Services`, `HCPCS Code`) %>%
  mutate(`HCPCS Code` = as.numeric(`HCPCS Code`)) %>%
  left_join(rev_new) %>%
  mutate(Rate = replace_na(Rate, 0))
```

```
## Warning: NAs introduced by coercion
```

```
## Joining, by = "HCPCS Code"
```

```
new_mcare_tot_per_fte$newrate = rowMaxs(cbind(new_mcare_tot_per_fte$Rate, new_mcare_tot_per_fte`Average Medicare Allowed Amount`))
```

```
new_mcare_tot_per_fte = new_mcare_tot_per_fte %>%
  group_by(`National Provider Identifier`) %>%
  summarise(totmcareperfte = sum(newrate * `Number of Services`))
```

```
summary((otherrev_tot_per_fte+mcare_tot_per_fte$totmcareperfte)/denominator)
```

```
## Min. 1st Qu. Median Mean 3rd Qu. Max.
## 0.056 0.056 0.056 0.056 0.056 0.056
```

```
summary((new_otherrev_tot_per_fte+new_mcare_tot_per_fte$totmcareperfte)/denominator)
```

```
## Min. 1st Qu. Median Mean 3rd Qu. Max.
```

```
## 0.05600 0.05965 0.05993 0.05985 0.06006 0.10298
```

```
summary((new_otherrev_tot_per_fte+new_mcare_tot_per_fte$totmcareperfte)/denominator)-summary((otherrev_tot_per_fte+other_mcare_tot_per_fte$totmcareperfte)/denominator)
```

```
##      Min.    1st Qu.      Median        Mean     3rd Qu.        Max.
## 4.100e-07 3.647e-03 3.928e-03 3.853e-03 4.064e-03 4.698e-02
```

upcoding

```
#5% upcode 3=>4 and 4=>5
```

```
visit_freq2 = visit_freq
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99205] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99205]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99204] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99204]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99204] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99204]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99203] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99203]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99215] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99215]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99214] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99214]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99214] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99214]
```

```
visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99213] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99213]
```

```
rev_new = visit_freq2 %>%
```

```
  full_join(rates_new) %>%
```

```
  select(`HCPCS Code`, nmcare, nmcarelo, nmcarehi, Rate) %>%
```

```
  mutate(rev = nmcare * Rate,
```

```
         revlo = nmcarelo * Rate,
```

```
         revhi = nmcarehi * Rate)
```

```
## Joining, by = "HCPCS Code"
```

```
revnew = sum(na.omit(rev_new$rev))
```

```
revnewlo = sum(na.omit(rev_new$revlo))
```

```
revnewhi = sum(na.omit(rev_new$revhi))
```

```
revdiff2 = revnew - revold
```

```
revdifflo2 = revnewlo - revoldlo
```

```
revdiffhi2 = revnewhi - revoldhi
```

```
revdiff2
```

```
## [1] 12324.94
```

```
revdifflo2
```

```
## [1] 445.41
```

```
revdiffhi2
```

```
## [1] 39258.17
```

```
(payments_new/(705.9*10^9) - payments_old/(705.9*10^9))*revdiff2/revdiff
```

```
##      ntotpay_pc
```

```
## 1 0.002649933
```

```

mean(new_otherrev_tot_per_fte - otherrev_tot_per_fte + revdiff) *revdiff2/revdiff

## [1] 70882.37

quantile((new_otherrev_tot_per_fte - otherrev_tot_per_fte+revdiff),c(.025,.975))*revdiff2/revdiff

##      2.5%      97.5%
## 30359.13 106934.67

revdiff2/revdiff*(summary((new_otherrev_tot_per_fte+new_mcare_tot_per_fte$totmcareperfte)/denominator)-

##      Min.      1st Qu.      Median      Mean      3rd Qu.      Max.
## 5.900e-07 5.266e-03 5.672e-03 5.564e-03 5.868e-03 6.784e-02

# variable upcoding

y = rep(0,11)

for (i in 1:11) {
  visit_freq2 = visit_freq
  upcoderate = (i-1)/100

  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99205] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99205]
  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99204] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99204]

  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99204] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99204]
  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99203] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99203]

  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99215] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99215]
  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99214] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99214]

  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99214] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99214]
  visit_freq2$nmcare[visit_freq2$`HCPCS Code`==99213] = visit_freq$nmcare[visit_freq$`HCPCS Code`==99213]

  rev_new = visit_freq2 %>%
    full_join(rates_new) %>%
    select(`HCPCS Code`, nmcare,nmcarelo,nmcarehi, Rate) %>%
    mutate(rev = nmcare * Rate,
           revlo = nmcarelo * Rate,
           revhi = nmcarehi * Rate)

  revnew = sum(na.omit(rev_new$rev))
  revnewlo = sum(na.omit(rev_new$revlo))
  revnewhi = sum(na.omit(rev_new$revhi))

  revdiff2 = revnew - revold
  revdifflo2 = revnewlo - revoldlo
  revdiffhi2 = revnewhi - revoldhi

  revdiff2
  revdifflo2
  revdiffhi2

y[i] = as.numeric((payments_new/(705.9*10^9) - payments_old/(705.9*10^9))*revdiff2/revdiff*100+2.1)

```

```
}
```

```
## Joining, by = "HCPCS Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS  
## Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS  
## Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS  
## Code"Joining, by = "HCPCS Code"Joining, by = "HCPCS Code"
```

```
x = (1:11-1)  
df = data.frame(x,y)  
p<-ggplot(df, aes(x=x, y=y)) +  
  geom_line(aes(color='firebrick'))+  
  geom_point(aes(color='firebrick'))+  
  scale_y_continuous(limits = c(0, 3)) +  
  theme_minimal()+  
  xlab("% of visits upcoded (from level-3 to -4, and level-4 to -5)") +  
  ylab(expression(atop("Medicare primary care spending", paste("as % of total Medicare spending")))) +  
  theme(legend.position="none")  
p
```

Medicare-PCP-spend_files/figure-latex/upcode-1.pdf