

Dental Plans

After completing this section, students should be able to:

- Make rough estimates of the probability of dental care events from available data.
- Make rough estimates of the average cost of health care procedures from available data.
- Estimate expected health care costs on various dental insurance plans, under simplifying assumptions.

Introduction

UNC's Dental insurance provides three possible dental plans to employees, with the following monthly fees. It is also possible to opt out and get no plan.

| Coverage Level | High Option | Classic Option | Low Option |
|----------------|-------------|----------------|------------|
| Employee Only | \$49.86 | \$35.90 | \$22.68 |

The Low Option covers:

- Diagnostic and preventive services, such as oral exams, cleanings and x-rays.
- Basic services, such as fillings, extractions, root canal therapy and treatment of gum disease.

The Classic Option plan and High Option plan also cover:

- Major services, such as crowns, dentures and bridges, as detailed below.

Health plan benefits are described here: <https://oshr.nc.gov/2022-ncflex-enrollment-guide-universities/open>

| Benefit Category | High Option | Classic Option | Low Option |
|--|------------------------|------------------------|------------------------|
| Annual Deductible (per person/per family) | \$50/\$150 | \$25/\$75 | \$25/\$75 |
| Annual Maximum (per covered person; does not include orthodontic services under the Classic and High Option plans) | \$5,000 | \$1,500 | \$1,000 |
| Lifetime Orthodontic Maximum ¹ (per covered person) | \$1,500 | \$1,500 | N/A |
| Benefit Category | Plan Pays ³ | Plan Pays ³ | Plan Pays ³ |
| Diagnostic and Preventive² | | | |
| Oral exams, preventive cleanings, X-rays, fluoride treatments, sealants, and space maintainers | 100% | 100% | 100% after deductible |
| Basic² | | | |
| Fillings, simple extractions, endodontics, re-cement crowns, inlays and bridges, repair of removable dentures | 80% after deductible | 60% after deductible | 50% after deductible |
| Periodontal services, oral surgery, and general anesthesia | 50% after deductible | | |
| Major² | | | |
| Includes crowns, dentures, bridges, fixed bridge repairs, denture adjustments/relining, implants | 50% after deductible | 50% after deductible | Not Covered |
| Orthodontics² | | | |
| Orthodontic services for dependent children up to age 19 | 50% | 50% | Not Covered |

For simplicity, we will only consider routine exams, cleaning, x-rays, fillings, crowns, extractions, and root canals. E.g. we will ignore bridges, and orthodontics.

Here are average costs of dental procedures, according to the insurance brokerage company Member Benefits

| Procedure | Includes | Cost | Probability/ Freq |
|------------|--|------------------|-------------------|
| Check-up | exam, x-rays, and cleaning | \$288 | |
| | x-rays only | \$140 | |
| | exam and cleaning only | \$148 | |
| Filling | single, silver amalgam filling | \$50 to \$150 | |
| | single, tooth-colored composite filling | \$90 to \$250 | |
| | single, cast-gold or porcelain filling | \$250 to \$4,500 | |
| Extraction | non-surgical, gum-erupted tooth extraction | \$75 to \$300 | |
| | surgical extraction utilizing anesthesia | \$150 to \$650 | |
| | soft-tissue and complicated surgical extractions | \$185 to \$600 | |
| | wisdom tooth extraction | \$75 to \$200 | |
| Crown | single resin crown | \$328 | |
| | single porcelain-fused crown | \$821 | |
| | single full cast high noble metal crown | \$776 | |
| Root canal | single, exposed root removal procedure | \$120 | |
| | single, residual tooth root removal procedure | \$185 | |

According to www.authoritydental.org, bitewings cost \$35 each on average and there are 4 to a standard set.

Estimation

Here are some numbers to help you estimate the annual probability or frequency of some of these procedures.

- U.S. adults age 50 - 64 had an average of 5.30 missing permanent teeth. NIH
- U.S. adults age 50 - 64 had 27.35 filled surfaces on average. NIH (1999 - 2004)
- 5 million people in the US have 10 million wisdom teeth removed each year. Vox.com
- About 15.1 million root canals are performed in the US every year American Association of Endodontists
- About 2.3 million crowns are made annually. American College of Prosthodontists

The following charts contain some of the information summarized above.

1999–2004

| Characteristic | Decayed permanent teeth (DT) | Missing permanent teeth (MT) | Filled permanent teeth (FT) | Total decayed, missing, or filled permanent teeth (DMFT) |
|----------------|------------------------------|------------------------------|-----------------------------|--|
| Age | | | | |
| 20 to 34 years | 0.93 | 0.62 | 4.61 | 6.16 |
| 35 to 49 years | 0.75 | 2.39 | 7.78 | 10.91 |
| 50 to 64 years | 0.55 | 5.30 | 9.20 | 15.05 |

| Characteristic | Decayed permanent surfaces (DS) | Missing permanent surfaces (MS) | Filled permanent surfaces (FS) | Total decayed, missing, or filled permanent surfaces (DMFS) |
|----------------|---------------------------------|---------------------------------|--------------------------------|---|
| Age | | | | |
| 20 to 34 years | 1.73 | 3.04 | 8.62 | 13.39 |
| 35 to 49 years | 1.55 | 11.52 | 18.38 | 31.46 |
| 50 to 64 years | 1.22 | 25.31 | 27.35 | 53.87 |

Given that adults age 50 - 64 have an average of 27.35 filled surfaces in permanent teeth, about how many fillings does a person get on average per year?

Given that adults age 50 - 64 have an average of 5.3 missing permanent teeth, about how many permanent teeth does a person lose on average per year? (PollEv)

Separately estimate the probability / frequency of a wisdom tooth extraction in a given year,

Use your two answers above to estimate how many non-wisdom tooth extractions a person can expect in a given year.

What assumptions are we making that may not be correct?

Use similar reasoning to estimate the frequency / probability of a person having a root canal in a given year. (PollEv)

Use similar reasoning to estimate the frequency / probability of a crown in a given year.

Expected costs

Use these estimates, and the explanations of insurance benefits, to estimate the expected cost of a person under each dental insurance plan and the no insurance option. Use the spreadsheet in <https://tinyurl.com/math115unc> to organize information.

For simplicity, we will ignore annual maximums and deductibles for procedures, and just charge everyone the deductible separately at the end.

Which dental plan saves you the most money, or is it cheapest to "insure yourself" and not buy one at all?