

Sex Differences in Prescription Medication Use and Costs in a
Large, National Commercial Sample: 1999

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Summary: This study provides a benchmark for understanding prescription drug utilization and expenditures by males and females at different age groups.

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Abstract

Objective: To provide a benchmark of drug utilization and expenditures by males and females at different age groups.

Study Design: A retrospective database analysis of pharmacy claims filled by members of a large pharmacy benefit manager.

Patients and Methods: Participants were 1,294,295 members of a large pharmacy benefit manager who resided across the United States and were continuously eligible for benefits during the study period (January 1, 1999 through December 31, 1999). Sex differences in prescription drug use and costs were examined overall, and for the 15 most-frequently used drug groups at each of 9 age categories.

Results: Females were more likely than males to fill at least one prescription during the study year overall (71% vs. 59%). Among members who used prescription drugs, females filled more prescriptions per year than males (16.2 vs. 12.6), but the mean billed ingredient cost per prescription was greater for males than females (\$30.84 vs. \$27.63). Female members spent a mean of \$382.88 and males spent a mean of \$290.39 on prescription drugs during 1999.

Conclusions: Overall, females clearly use more prescription medications than males. Sex differences vary with age group, with the greatest differences occurring during the reproductive

years. The greater yearly cost of prescriptions shown for females in this study is due to greater utilization by females rather than to greater cost per prescription, as the average cost per prescription is greater for males.

Background

Management of the drug benefit involves more than the reporting of overall utilization and cost figures. In order to meet or exceed standards of quality health care and fiscal responsibility, providers of pharmacy benefits must understand how drug utilization varies with the demographic composition of their members. A clear understanding of how subgroups of members use prescription drugs allows plan sponsors to anticipate which members will be affected most by changes in benefit structures, introduction of new clinical guidelines or changes in existing guidelines, and implementation of cost management strategies.

Studies in the United States and other countries using physician surveys, patient surveys, and household interviews report that females are more likely to use prescription medications than males¹⁻⁵ and use more prescribed medications.²⁻⁵ Using administrative databases, two large Canadian studies have evaluated medication use by each gender at all age groups.⁶⁻⁷ Results from Canadian studies may not generalize to a United States population since the health systems, prescription drug costs, and available drugs are different in Canada and the US. Little is reported in the literature regarding the impact of sex

on prescription expenditures. Furthermore, no recent analysis in the United States reviews patterns of prescription use for females and males across all age groups. An updated review of this type is important due to the large number of prescription drugs that come to market every year and the increasing prevalence of direct-to-consumer advertising in the US.

Accordingly, the purpose of this study is to update and expand existing knowledge of drug utilization and expenditures by males and females using an administrative database reflecting drug use across the United States over a one-year period.

Methods

Participants were drawn from a research database maintained by Express Scripts, Inc., a pharmacy benefit management company. This database contains eligibility and pharmacy claim information for the calendar year 1999 for 2,559,445 members selected randomly from the commercially-insured (i.e. not Medicare or Medicaid) membership of Express Scripts.

The study period spanned January 1, 1999 through December 31, 1999. To be included in the study, members had to be continuously eligible for pharmacy benefits during the study period. Therefore, members with only partial eligibility across the study year (including children less than one year of age on January 1, 1999) were excluded from the study (N = 1,263,497). Members with invalid dates of birth (N = 234) and members from a group with duplicate pharmacy claims (N = 1,419) were also excluded from the study, resulting in a final sample size of 1,294,295 members.

Sex differences in prescription drug use and costs during 1999 were examined overall, and for the 15 most-frequently used drug groups at each age category. Frequency of use of each drug group was based on the percentage of sample members, regardless

of sex, filling at least one prescription in that drug group during the study year. Participants were assigned to age groups based on their age as of January 1, 1999. After examining the existing literature on sex differences, age categories were constructed using a two step process. First, ages that reflected life stages that could potentially impact pharmaceutical utilization, such as young childhood (1 to 5 years) and older adult age (65 years and over) were assigned to categories. Second, to allow more detailed results, the remaining adult years were assigned to 10-year age groupings.

Prescriptions were converted to 30-day equivalents (e.g. a prescription for a 90-day supply of medication was counted as three prescriptions, each with a 30-day supply). The Generic Product Identifier (GPI) coding system⁸ was used to assign prescriptions to drug groups. In this system, the first two digits of the GPI number attached to the pharmacy claim signify the drug group to which the prescription belongs. Generally, the name of each drug group is reflective of the prescription drugs contained within that group, and medications of the same type are clustered into the same group. However, there are a few notable exceptions to this rule: (1) Although there is an "antihistamine" drug group, the cough and cold group includes combination products containing an antihistamine, (2)

medications for high blood pressure are spread across four groups: antihypertensives, beta blockers, calcium channel blockers, and diuretics, (3) the antianxiety agents, hypnotics, and anticonvulsant groups each contain some benzodiazapine medications, (4) the estrogen drug group contains single-entity estrogen products, as well as estrogen combination products (e.g. estrogen-progestogen and estrogen-androgen combinations), (5) the anti-rheumatics include non-steroidal anti-inflammatory agents, COX-II agents, and disease- modifying antirheumatic drugs (e.g. etanercept, some forms of methotrexate).

Dependent variables measured for each member over the study year were whether or not the member filled at least one prescription, number of prescriptions filled, the mean billed ingredient cost per prescription over all prescriptions filled, and the total billed ingredient costs over all prescriptions filled during the year. These dependent variables were computed overall and within each of the 15 most-frequently used therapy classes.

Values on the dependent variables were compared for males and females overall and within each age group using bivariate statistics. Sex differences in filling at least one prescription were tested using chi-square. Sex differences in

the remaining dependent variables were tested using t-tests for independent samples. Post-hoc analyses were conducted when appropriate to explain significant and important differences across the sexes. Unless otherwise noted, an alpha level of .001 was taken to indicate statistical significance in all analyses due to the large number of study participants.

Results

Table 1 shows the number of males and females in the study sample along with the number of males and females in each age category.

Use of at least one prescription. Overall, females were more likely than males to fill at least one prescription for a drug during the study year (71% vs. 59%). However, sex differences in the likelihood of using a prescription drug varied by age group (Figure 1). In the youngest age group, children 1 to 5 years, boys were slightly more likely to fill a prescription drug than girls. Among children aged 6 through 12, there was no difference in the likelihood of filling at least one prescription. In every age group thereafter, females were more likely to use prescription drugs than males. The largest differences between the sexes were found for individuals in the 18 to 24 year and 25 to 34 year age categories, where there were differences of more than 20 percentage points in the proportion of males and females who received at least one drug. There was only a slight difference in the likelihood of using a prescription drug among men and women aged 65 years and above.

The overall pattern of sex differences in likelihood of filling one or more prescriptions at each age group persisted even after the data were reanalyzed following exclusion of prescriptions for contraceptives and estrogens, drugs used almost exclusively by females.

Based on the percentage of members using at least one prescription in that group during the study year, the 15 drug groups used most frequently were the penicillins (with 20% of members using that group), cough/cold/allergy (19%), narcotic analgesics (15%), macrolide antibiotics (15%), anti-rheumatic (13%), dermatological (13%), cephalosporins (11%), antihistamines (10%), antidepressants (8%), ulcer drugs (7%), antihypertensives (7%), antiasthmatic (6%), corticosteroids (6%), estrogens (6%), and systemic and topical nasal products (6%). Among the top 15 drug groups (Table 2), antihypertensives was the only drug group for which males were more likely than females to fill a prescription, although the difference between the sexes was small (1.6 percentage points). For the remaining 14 drug groups, females were more likely to fill at least one prescription. Notably, females were more than twice as likely to fill a prescription for an antidepressant.

Number of prescriptions per member. As inspection of Figure 2 shows, the number of prescriptions filled per utilizing member per year rose with increasing age group. There was a difference of over 30 prescriptions per member per year between the youngest and oldest age categories for both males and females.

Among members filling at least one prescription during the study year, females filled on average four more prescriptions per year overall than did males (Table 2). Boys filled slightly more prescriptions per utilizing member than girls among children less than 12 years of age, but in every older age group, females filled more prescriptions than males (Figure 2). The largest difference in number of prescriptions per utilizer per year was shown in the 55 to 64 year age group, where women filled an average of 7.2 more prescriptions per year than men.

Differences in the number of prescriptions per utilizing member were also examined within the top 15 drug groups (Table 2). A sex difference was shown in the antidepressant group where females filled 0.7 more prescriptions per year than males. In the ulcer drug and antihypertensive categories, males filled more prescriptions than females, with differences of 0.4 and 0.5 prescriptions respectively. With the exception of female hormones, none of the remaining drug groups showed differences

between utilizing males and females of more than 0.2 prescriptions per year.

Mean cost per prescription. The mean cost was \$3.21 higher per prescription for males than for females overall (Table 2). In every age group, the cost per prescription was higher for males than females (Figure 3), although the difference was smallest for the youngest age group (\$1.38) and largest for the 45 to 54 year and 55 to 64 year age groups (\$5.17 and \$5.77 respectively). The sex discrepancy in cost per prescription could not be explained by the differential use of generic medications by males and females as males actually filled a slightly higher percentage of generic prescriptions overall (39.8%) than did females (37.8%).

Within the top 15 drug groups however (Table 2), the mean cost per prescription was not always greater for males than females. In six of the 15 groups, cost per prescription was greater for females (cough/cold/allergy, narcotic analgesics, antirheumatics, cephalosporins, antidepressants, and antiasthmatics). The difference between the sexes was generally small in these drug groups however, ranging from \$0.22 to \$2.00.

The largest sex difference was found in the ulcer drugs group, where the mean cost per prescription per member was \$5.32 higher for males than for females. A combination of factors appears to be responsible for the sex gap within this drug group. First, males used more expensive drugs than females. Within the ulcer drug group, 57.3 percent of prescriptions filled by males were for two proton pump inhibitors costing more than \$100 per prescription on average (omeprazole and lansoprazole), whereas only 54.7 percent of females' prescriptions were for those drugs. Sex differences in the percentage of prescriptions for omeprazole and lansoprazole were more dramatic within the age groups with the greatest cost per prescription difference: 18 to 24 years (55.3% for males versus 42.4% for females; mean cost difference = \$7.49), 25 to 34 years (61.7% for males, 51.0% for females; mean cost difference = \$10.52), and 35 to 44 years (62.9% for males, 56.3% for females; mean cost difference = \$8.79). The proton pump inhibitors had similar mean doses per day in males and females.

Second, females filled a larger percentage of prescriptions for generic ulcer medications than males (31.0% versus 28.6%), partly as a result of their lower use of omeprazole and lansoprazole (both branded medications). Third, males received

a slightly greater supply of medication per prescription than females (0.57 days more per prescription).

Cost of prescription drugs per member per year. (Figure 4).

Overall, females spent a mean of \$92.49 more than males on prescription medication during 1999 (Table 2). In the youngest age groups the yearly cost of medication was greater for males than females, with a difference of \$14.64 in the 1 to 5 year age group and a difference of \$27.49 in the 6 to 12 year age group (Figure 4). There was no difference in annual costs between boys and girls aged 13 to 17 years. In every older age group, costs were higher for females than males. The largest difference between the sexes was found in the 45 to 54 year age category, where females paid an average of \$171.49 more for prescription medications per year than males.

For females, costs rose with each increase in age group. For males, costs increased through the 13 to 17 year age group, then decreased among males 18 to 24, increasing again for every age group thereafter.

Discussion

Our study provides an updated analysis of prescription drug utilization and expenditures by males and females at different age groups. Within our commercial population, we found that females are (1) more likely to use prescription medications than males, and (2) among members who use prescription drugs, females receive more prescriptions per year on average. The greater yearly cost of prescriptions shown for females in this study is due to greater utilization by females rather than to greater cost per prescription, as the average cost per prescription is actually greater for males.

Despite differences in time, geographic location, and methodology, this study supports research by others which indicates that females are more likely than males to use prescription drugs^{1-7,9} and that females use more medications per utilizer.²⁻⁶ Previous work has also shown that sex differences in the use of prescription medications vary by age, such that boys are more likely to use prescription drugs than girls below approximately age six.^{6-7,9} Likewise, others have also reported that women are more likely to use drugs than men throughout adulthood, with sex differences being most pronounced during the reproductive years and declining with increasing adult age.^{2,6-7,9}

The difference in the percentages of males and females over 65 that were pharmaceutical users was small in our analysis, consistent with other studies.^{3,6,9-13}

Unlike most other studies evaluating medication use between the genders, our study included both utilization and expenditures. A 1989 analysis of medication costs in Saskatchewan also reported that medication costs per prescription were higher for males than females, but they did not report mean prescription costs across all age groups.⁷

Based on epidemiologic data, the reported differences in medication utilization were not surprising. Although men and women are equally likely to receive a prescription when they visit their physician, women are more likely to visit a physician in the first place.¹ Sixty-six percent of physician visits result in one or more drugs being prescribed or provided to patients.¹ Greater physician visit and drug utilization rates by women may reflect health needs associated with women's reproductive role, greater morbidity, physician bias, differences in health reporting, and/or differences in illness preventive attitudes.^{5,14-16}

In only one (antihypertensives) of the 15 most-frequently used drug groups were males more likely than females to fill at least one prescription, and the sex difference in that drug group was less than two percentage points. The antihypertensive drug group includes angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor antagonists, alpha blockers, vasodilators, clonidine, and other miscellaneous products. Drugs in the antihypertensive class are used for a variety of indications, including hypertension, benign prostatic hypertrophy, and congestive heart failure. In general, males experience heart conditions that are often treated with ACE inhibitors (eg, congestive heart failure, myocardial infarctions, and hypertension) at an earlier age than women.¹⁷ Also, one study found that males were more likely to use ACE inhibitors to treat hypertension than females, who were more likely than males to use diuretics.¹⁸

We found a two-fold sex difference in the use of antidepressants. Others have found that females are more likely to use psychotropic drugs than males.^{11,19-21} Furthermore, epidemiological studies consistently report that depression is about twice as common in women as in men.²²⁻²⁶ In addition to depressive disorders, antidepressants are also used to treat other conditions unique to or more prevalent in women (e.g.

anxiety disorders, premenstrual dysphoric disorder, and eating disorders).

In the remaining 13 drug groups, females were more likely to use medications than males, although the magnitude of the difference between males and females across drug groups differed, ranging from one to six percentage points. For example, women were more likely to fill prescriptions for narcotic analgesic and anti-rheumatic agents. This may be at least partially explained by conditions specific to women, such as dysmenorrhea, and conditions with a higher prevalence rate in women, such as migraine, fibromyalgia, and rheumatoid arthritis.²⁷⁻²⁹ In addition, women were more likely to fill a prescription for asthma, allergy drugs, cough/cold/allergy, and systemic and topical nasal products. Adult women do have a higher prevalence rates of allergic rhinitis, chronic sinusitis, asthma, and chronic bronchitis.³⁰

One explanation for males showing a higher mean cost per prescription is the relative combination of higher- and lower-cost drug groups used by each of the sexes. For example, the mean Average Wholesale Price (AWP) per prescription for estrogens (the drug group used most frequently by females, and the drug group which accounted for 8.1% of all prescriptions

filled by them) was \$22.59 in 1999.²¹ In comparison, the drug group used most commonly by males (antihypertensives, which represented 9.1% of 1999 prescriptions filled by males), had a mean 1999 AWP per prescription of \$39.96.²¹

Another explanation concerns the relative cost of the drugs within particular drug groups for males and females. In nine of the fifteen therapeutic groups, the mean cost per prescription was higher for males. However, sex differences were generally small except for ulcer drugs, where males had greater use of PPIs and lower use of generics.

Generally, ulcer medications are used for gastroesophageal reflux disease (GERD), peptic ulcer disease, and non-specific dyspepsia. The majority of PPI use is for GERD.³¹ According to government statistics, mild symptoms of GERD are more common in women than men, but men are more prone to the complications of GERD (i.e., Barrett's, esophagus, erosive esophagitis, esophageal stricture).³² Given that proton pump inhibitors have the highest healing rates in patients with GERD complications, it may be appropriate that males are prescribed these high-cost drugs at a higher rate than females.

This study found that females were more likely to use prescription drugs than males. However, we can not determine whether males or females are more likely to receive unnecessary medications since diagnostic data are not available. One possible explanation for this finding is that women are receiving unnecessary therapies. There is some suggestion that women are more likely to report symptoms, and that their symptoms are less likely to be explained medically.^{33,34} An alternative explanation is that the current state of medical science as it applies to women, is inadequate.

Generalizing the results of this study to other populations should be done cautiously. Individuals with prescription drug coverage are more likely to use medication,³⁵⁻³⁶ and use a greater variety of medications³⁶ than those without coverage. In addition, this study required that all participants were continuously eligible for prescription drug coverage for the entire year. Express Scripts has internal data which indicates that members who are only eligible for a portion of a year fill fewer prescriptions per month than members who are continuously eligible.

Conclusions

The results reported here can serve as a benchmark when examining trends over time in prescription drug use and costs among males and females of different ages. In addition, findings allow comparison of drug utilization and costs in the United States to that of other countries. And finally, these results can also be referenced by plan sponsors to anticipate which members will be affected most by changes in clinical guidelines or benefit structures, by initiation of clinical programs, or by implementation of cost management strategies.

The use of prescription medications costs money and is not without health risks (e.g. adverse drug reactions). Future research should assess whether the greater use of pharmaceuticals by females compared to males or the higher mean cost per prescription by males is appropriate.

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Table 1. Distribution of the study sample by sex and age group.

	<u>Females</u>		<u>Males</u>		<u>Total</u>	
	N	(%)	N	(%)	N	(%)
1-5 years	44,418	(48.5)	47,138	(51.5)	91,556	(7.1)
6-12 years	74,132	(48.8)	77,751	(51.2)	151,883	(11.7)
13-17 years	55,136	(48.7)	58,035	(51.3)	113,171	(8.7)
18-24 years	53,159	(51.6)	49,951	(48.4)	103,110	(8.0)
25-34 years	105,509	(52.7)	94,534	(47.3)	200,043	(15.5)
35-44 years	136,800	(52.6)	123,193	(47.4)	259,993	(20.1)
45-54 years	111,997	(52.3)	102,216	(47.7)	214,213	(16.6)
55-64 years	56,858	(50.0)	56,755	(50.0)	113,613	(8.8)
65 years and above	23,155	(49.6)	23,558	(50.4)	46,713	(3.6)
All ages	661,164	(51.1)	633,131	(48.9)	1,294,295	(100.0)

Table 2. Utilization and costs of prescription drugs by females and males overall and within the 15 most frequently used drug groups.

	N	% With ≥ 1 Prescription	Mean Number of Prescriptions Per Utilizing Member	Mean Cost Per Prescription Per Utilizing Member	Sum of Costs Per Member
Overall					
Females	661,164	70.8	16.2	\$27.63	\$382.88
Males	633,131	59.2	12.6	\$30.84	\$290.39
Penicillins					
Females	146,478	22.2	1.5*	\$16.70	\$5.90
Males	113,958	18.0	1.5	\$17.87	\$5.13
Cough/Cold/Allergy					
Females	142,282	21.5	2.2	\$15.40	\$9.68
Males	98,743	15.6	2.0	\$15.06	\$6.44

Narcotic analgesics

Females	110,257	16.7	2.8	\$8.70*	\$8.78
Males	81,797	12.9	2.6	\$8.48	\$6.39

Macrolide antibiotics

Females	111,239	16.8	1.5	\$34.74	\$8.71
Males	78,364	12.4	1.4	\$35.17	\$6.15

Anti-rheumatic

Females	100,231	15.2	2.7	\$27.23	\$17.34
Males	69,379	11.0	2.5	\$25.23	\$10.29

Dermatological

Females	96,873	14.7	2.2	\$29.06	\$11.14
Males	67,403	10.6	2.3	\$32.76	\$10.09

Cephalosporins

Females	82,526	12.5	1.4	\$34.15	\$6.36
Males	62,628	10.0	1.4	\$32.51	\$4.78

Antihistamines

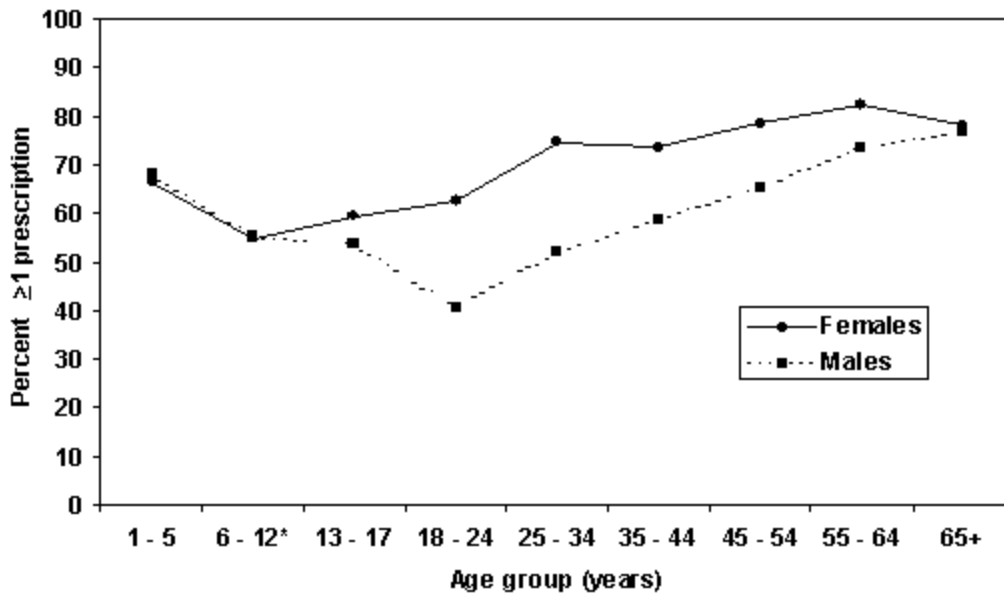
Females	79,507	12.0	2.9	\$41.19	\$16.27
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Males	51,446	8.1	2.8	\$42.38	\$10.64
Antidepressants					
Females	69,791	10.6	6.9	\$55.18*	\$42.30
Males	40,061	5.1	6.2	\$54.84	\$18.58
Ulcer drugs					
Females	55,744	8.4	4.9	\$67.03	\$31.87
Males	40,061	6.3	5.3	\$72.35	\$26.83
Antihypertensive					
Females	38,680	5.9	9.1	\$29.03	\$15.81
Males	47,335	7.5	9.6	\$30.55	\$22.27
Antiasthmatic					
Females	46,110	7.0	4.9*	\$25.87	\$12.29
Males	37,664	5.9	5.0	\$25.21	\$10.55
Corticosteroids					
Females	45,941	6.9	1.8	\$6.37	\$0.78
Males	37,436	5.9	1.7	\$6.83	\$0.68
Estrogens					

Females	79,162	12.0	8.9	\$17.10*	\$18.02
Males	1,302	0.2	6.5	\$17.26	\$0.23
Systemic and topical nasal products					
Females	45,392	6.9	2.5	\$40.88*	\$6.92
Males	33,309	5.3	2.5	\$41.01	\$5.48

* No significant difference between females and males at alpha = .001

Figure 1. Among all study participants, percentage of females and males at each age group filling at least one prescription per year.



* No significant difference between males and females at alpha = .001.

Figure 2. Among participants filling at least one prescription during the study year, mean number of prescriptions per member per year for females and males in each age group.

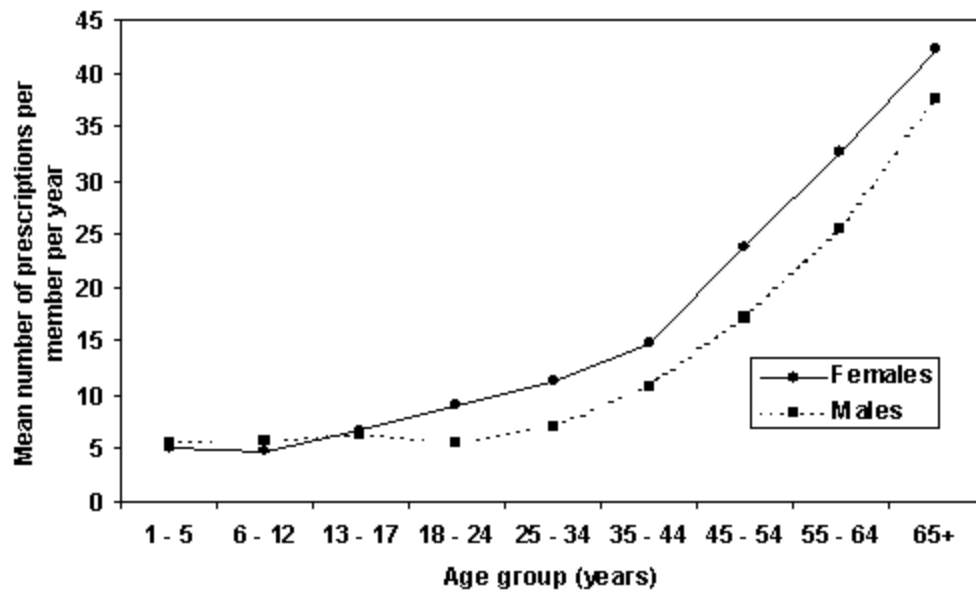


Figure 3. Among participants filling at least one prescription during the study year, mean cost per prescription for females and males in each age group.

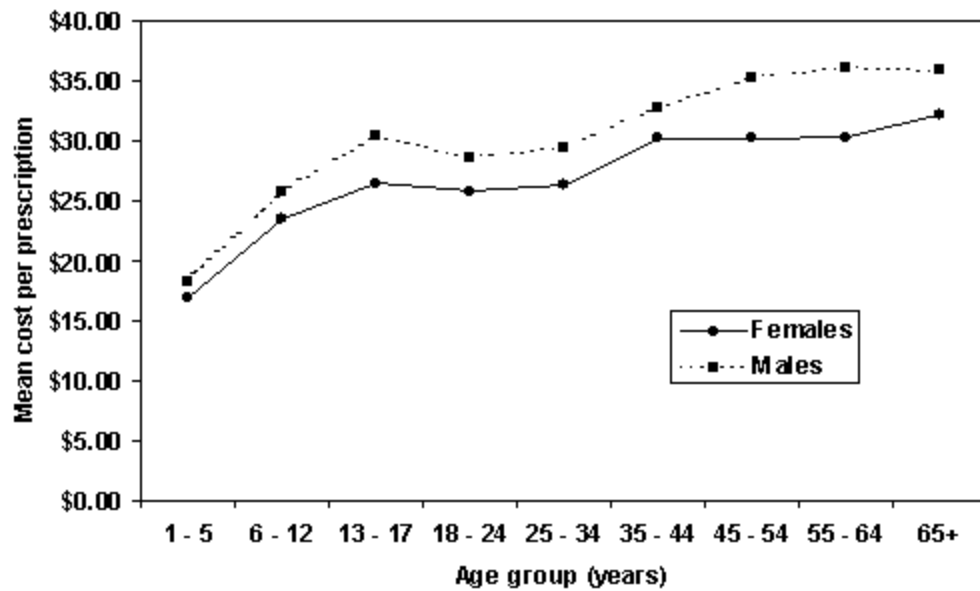


Figure 4. Among all study participants, mean total cost of prescription drugs over the study year for females and males in each age group.

