# Evaluating the Confluence of Demographic and Morbidity Parameters in Pharmaceutical Care

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## Abstract

*The analysis aims to investigate latent cost synthesis differentiations among distinct morbidity areas of pharmaceutical consumption and thus to take a thorough look at the generating process of pharmaceutical expenditure volatility that burdens OECD economies, and especially Greek economy, over the last years. The methodological vehicle for this purpose is the deployment of an algebraic form for the decomposition of pharmaceutical demand of prescription medicines into frequency and severity components. The analysis is supported by the use of the individual characteristic of age, which according to literature is a significant factor of pharmaceutical demand variability, and therapeutic category, which is herein ex ante considered a morbidity parameter of pharmaceutical demand. The decomposition procedure is applied for all therapeutic categories of medicines. According to the results, frequency effects play the key role towards severity ones for the pharmaceutical expenditure generating process, this norm does not however apply within each therapeutic category.*

**Key Words:** Medicine prescription, frequency, severity, age, therapeutic category, Greece

## *1. Introduction*

Over the years 2000-2009, the average annual growth in realper capita pharmaceutical expenditure of Greece was the highest among OECD countries (Organization for Economic Cooperation and Development OECD (2011)). Pharmaceutical expenditure increase has not abated since then. It is indicative that in 2012, Greece was classified among the European countries with the higher pharmaceutical costs, as Greek pharmaceutical expenditure accounted for 2% of the GDP, exceeding the corresponding European average of 1.6% (Carone et al. 2012). According to research deductions committed to literature, healthcare expenditure is an age-dependent branching process (see for example O'Connell 1996; Riphahn et al. 2003). In this work, we search for age patterns by tessellating the involved in pharmaceutical demand population into distinct morbidity strata and by comparing frequency and severity components between age classes across all therapeutic categories.

## *2. Methodology*

### 2.1 Data and variables

Raw data, extracted from the digitalized prescription system of Greece, included variables such as the appropriately encrypted social security number (AMKA), the prescription number, the price of medicine prescribed, the therapeutic category of the prescribed medicines, the date and place of prescription. Missing values processing as well as demand distribution truncation at the 99th percentile in order to minimize potential bias led to a sample of 326,826 observations which included 173,074 unique beneficiary cases. The use of therapeutic categories in the analysis is based on the Anatomical Therapeutic Chemical (ATC) classification system (World Health Organization WHO (2012))adjusted though to the specifications of the available primary data, including thus fifteen categories, namely, the cardiovascular system, the nervous system, the alimentary tract and metabolism, the musculo-skeletal system, the systemic hormonal preparations, the anti infective for systemic use, the blood and blood forming organs, the respiratory system, the genito-urinary system and sex hormones, the immune system, the dermatologicals, the antineoplastic and immunomodulating agents, the unclassified conditions, the sensory organs and additionally, as a separated therapeutic category, the ophthalmologicals.

### 2.2 Methodological Steps

Age is treated as a categorical variable, measured on a dichotomous scale, where the 65th year is appointed as a senescence threshold. Pharmaceutical demand is treated as an ordinal variable, i.e., it is defined as the counting number of medicines prescribed electronically per beneficiary. Initially, pharmaceutical demand data are investigated for asymmetry and over dispersion characteristics (Manning et al. 2005) for each age class. Secondly, a factorial model is chosen as a common methodological device for analysis of variance of pharmaceutical demand, where age and therapeutic category are used as fixed variability factors. Finally, the deployment of a compound function for the decomposition of per capita expected pharmaceutical expenditure into frequency and severity parameters is presented.

#### 2.2.1 The Factorial Model

In order to see whether pharmaceutical demand varies significantly under the interaction of age and therapeutic category, an F-test based on a factorial model with fixed effects is applied. The fitted statistical model used is:

$y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + (\varepsilon)_{ijk}$

where $y_{ijk}$are the observations of the dependent ordinal random variable of pharmaceutical demand, $\mu$ is a constant general mean, $\tau_i$ is the parameter corresponding to the effect of the ith level of the age factor (i=1 if age<65, i=2 if age≥65), $\beta_j$ is the parameter for the effect of the jth level of the therapeutic category (j=1, 2,…, 15), $(\tau\beta)_{ij}$ is the interaction between $\tau_i$ and $\beta_j$ (ij=11, 21, 12, 22,…,115, 215) and$(\varepsilon)_{ijk}$ are the independent identically normally distributed disturbances (residuals) with zero mean and $\sigma^2$ variance (Montgomery 1997).

#### 2.2.2 The Compound Loss Model

The decomposition of pharmaceutical demand is based upon the methodological outline of compound loss models presented in Klugman (1998). Loss is herein defined as the euro amount corresponding to the medicine prescription a beneficiary was provided with. Frequency is set as the ordinal random variable of the counting number of medicines prescribed per unique beneficiary. Severity is the random variable of losses. The compound loss function is considered a composite function of frequency and severity parameters. Aggregate pharmaceutical losses, denoted by S, are defined as the sum: $S = X_1 + X_2 + \cdots + X_N$, where the Xs correspond to severity independent random variables and N corresponds to frequency random variable. S has a distribution function:

$F_S(x) = Pr(S \le x) = \sum_{n=0}^{\infty} p_n Pr(S \le x|N = n) = \sum_{n=0}^{\infty} p_n F_X^{*n}(x)$, (1)

The distribution (1) is called a compound distribution, where $F_X(x) = Pr(X \le x)$ is the common distribution function (cdf) of the $X_S$ and $p_n = Pr(N = n)$.

In (1), $F_X^{*n}(x)$ is the "n-fold convolution" of the cdf of X.
It can be obtained as:

$F_X^{*0}(x) = \begin{cases} 0, & x < 0 \\ 1, & x \ge 0 \end{cases}$ and

$F_X^{*k}(x) = \int_{-\infty}^{\infty} F_X^{*(k-1)}(x - y) dF_X(y)$, (2)

In the case of discrete random variables with probabilities at 0, 1, 2,…, equation (2) reduces to $F_X^{*k}(x) = \sum_{y=0}^{x} F_X^{*(k-1)}(x-y) f_X(y), \quad x = 0, 1, 2, \ldots$

The probability function for the distribution of aggregate losses is $f_S(x) = \sum_{n=0}^{\infty} p_n f_X^{*n}(x)$

The probability generating function of S is:

$$P_s(z) = E[z^S] = \sum_{n=0}^{\infty} E[z^{X_1+X_2+\cdots+X_n} | N = n] \Pr(N = n) = \sum_{n=0}^{\infty} E\left[\prod_{j=1}^{n} z^{X_j}\right] \Pr(N = n) = \sum_{n=0}^{\infty} \Pr(N = n)[P_X(z)]^n$$

$$= E[P_X(z)]^n = P_N[P_X(z)], \quad (3)$$

due to the independence of $X_1, \ldots, X_n$ for fixed n.

With regard to the moment generating function, we have

$M_S(z) = P_N[M_X(z)]$,

where the secondary distribution corresponds to the claim size distribution.

From (3), the moments of S can be obtained in terms of the moments of N and the $X_j$s. The first two moments are:

$E(S) = \mu'_{S1} = \mu'_{N1}\mu'_{X1}$ and $Var(S) = \mu_{S2} = \mu'_{N1}\mu_{X2} + \mu_{N2}(\mu'_{X1})^2$

corresponding to E(S)=E(N)*E(X) and Var(S)=E(N)*Var(X)+Var(N)*[E(X)]$^2$, i.e.:

E(S) = E(Frequency component)*E(Severity component) and:

Var(S)= E(Frequency component)*Var(Severity component) + Var(Frequency component)*[E(Severity component)]$^2$

E(Frequency) is the expected value of frequency variable and E(Severity) is the expected value of severity variable, where, E(Frequency)≥1 and E(Severity)≥1.

## *3. Results*

### 3.1Descriptive Statistics

Out of the 326,826 cases,186,009 cases, namely the 56.9%, correspond to ages under 65 years. The remaining 43.1% belongs to the group of the senior, aged 65 years and over, beneficiaries. The mean number of prescribed medicines equals 3.4 drugs per capita and the standard deviation equals 4.4 drugs per capita. The mean number of prescribed medicines in the under the 65$^{th}$ year of age population equals 2.9 drugs per capita and the standard deviation equals 4.1 drugs per capita. The mean number of prescribed medicines in the aged over 65 years equals 3.9 drugs per capita and the standard deviation equals 4.7 drugs per capita (tables 2-4). The median number of medicines prescribed equals 2 in the entire age amplitude (table 1). Pharmaceutical demand data are governed by overdispersion attributes within both age classes; this is statistically described by the coefficient of variation of claims which exceeds the value "one", as is equal to 1.4 and to 1.21 in the age classes under 65 years and 65 years and over, respectively. However, overdispersion is not observed across the entire therapeutic spectrum. The therapeutic categories of medicines where overdispersion attributes appear in the overall age band are those of the nervous system, the systemic hormonal preparations, the blood and blood forming organs and the respiratory system (tables 2-4).

### 3.2 Statistical Inference

Table 5 presents the results of analysis of variance according to a factorial model with fixed factors. Independence hypothesis between age factor and therapeutic category is rejected at the 1% level. Mean differences between age classes are examined with t-tests. Results are given in table 6. In table 7, the mean and standard error of mean for age are given by therapeutic category.

The demand for medicine prescriptions is intensified in ages 65 and over. Deviation from this norm is observed in morbidity areas connected to drug prescribing for the nervous system, the blood and blood forming organs and the antineoplastic and immunomodulating agents, where the lead is taken by the population aged under 65 years. As for the immune system and the unclassified medicines, according to the findings the age factor does not interact significantly with pharmaceutical demand (table 6).

### 3.3 Frequency and Severity Point Estimates

Frequency and severity point estimates are presented in Table 8. The corresponding results for each age class are given in tables 9 and 10.

Frequency is more important as a loss factor overall. Frequency to severity ratio equals 2.72 in ages 65 and over and 2.02 in ages under 65. The therapeutic areas where severity is more important as a source of pharmaceutical cost pertain to the immune system(where the frequency to severity ratio equals 0.62 in ages 65 and over and 0.78 in ages under 65), the antineoplastic and immunomodulating agents(where the frequency to severity ratio equals 0.48 in ages 65 and over and 0.76 in ages under 65) and the unclassified medicines(where the frequency to severity ratio equals 0.55 in ages 65 and over and 0.50 in ages under 65).

The therapeutic categories where the frequency to severity ratio exceeds the average underlining thus the morbidity areas where pharmaceutical demand iterations are more important as cost factors than the prices of the prescription drugs themselves, are those concerning the cardiovascular system (4.4), the nervous system (3.2), the ophthalmologicals (2.9) and the blood and blood forming organs (2.8). Frequency to severity ratio gets its maximum value in the age class of 65 years and over and within the therapeutic category of the cardiovascular system (i.e. 5.0).

## *4. Discussion*

This analysis highlights the need for longitudinal monitoring of qualitative composition of the underlying in pharmaceutical consumption population, for the effective management of healthcare resources and projections of public pharmaceutical expenditure in the long run.

According to the results, pharmaceutical demand is over dispersed within both age classes and significant interaction effects among age and therapeutic category factors emerge for pharmaceutical demand variability. Frequency appears to be more important as a pharmaceutical cost parameter than severity although the opposite applies to the cases of the antineoplastic and immunomodulating agents, the immune system and the unclassified medicines. Frequency parameter maximizes in the prescribing of medicines for the cardiovascular system.

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**Table 1. Empirical Relative Frequencies for the Number of Medicines Prescribed Per Beneficiary**

| Number of medicines prescribed | Overall age bandwidth (%) | Below 65 (%) | 65 and over (%) |
|---|---|---|---|
| 1 | 38.1 | 45.1 | 30.7 |
| 2 | 25.1 | 25.2 | 25.0 |
| 3 | 9.3 | 8.3 | 10.3 |
| 4 | 8.3 | 6.9 | 9.9 |
| 5 | 3.4 | 2.7 | 4.1 |
| 6 | 4.1 | 3.2 | 5.0 |
| 7 | 1.7 | 1.2 | 2.3 |
| 8 | 2.1 | 1.6 | 2.7 |
| 9 | 1.2 | 0.9 | 1.6 |
| 10 | 1.2 | 0.0 | 1.5 |
| >10 | 5.4 | 4.9 | 6.9 |
| Total | 100.0 | 100.0 | 100.0 |

**Table 2. Descriptive Statistics and Overdispersion Characteristics for the Number of Medicines Prescribed Per Beneficiary. All Age Groups**

| Therapeutic category | Arithmetic Mean | Standard Deviation | Coefficient of Variation | Mean to Median Ratio | 99th Percentile to 95th Percentile Ratio |
|---|---|---|---|---|---|
| Cardiovascular system (N=73,300) | 5.68 | 5.88 | 1.03 | 1.42 | 1.71 |
| Nervous system (N=37,598) | 5.11 | 6.50 | 1.27 | 1.70 | 1.88 |
| Alimentary tract and metabolism (N=33,611) | 2.17 | 2.00 | 0.92 | 1.08 | 1.67 |
| Musculo-skeletal system (N=32,238) | 2.15 | 1.91 | 0.89 | 1.07 | 1.67 |
| Systemic hormonal preparations (N=23,283) | 2.92 | 3.14 | 1.08 | 1.47 | 1.75 |
| Antiinfectives for systemic use (N=34,146) | 1.99 | 2.16 | 1.09 | 1.99 | 2.00 |
| Blood and blood forming organs (N=16,833) | 3.52 | 4.59 | 1.31 | 1.76 | 2.08 |
| Respiratory system (N=19,421) | 2.67 | 3.69 | 1.38 | 1.34 | 2.38 |
| Genito-urinary system and sex hormones (N=10,373) | 2.56 | 2.31 | 0.90 | 1.24 | 1.71 |
| Immune system (N=15,471) | 1.38 | 0.87 | 0.62 | 1.38 | 1.67 |
| Sensory organs (N=9,536) | 1.27 | 0.66 | 0.52 | 1.27 | 2.00 |
| Ophthalmologicals (N=8,182) | 3.09 | 3.17 | 1.03 | 1.54 | 1.78 |
| Dermatologicals (N=8,394) | 1.77 | 1.47 | 0.83 | 1.77 | 1.75 |
| Antineoplastic and immunomodulating agents (N=2,223) | 2.54 | 2.43 | 0.96 | 1.27 | 2.00 |
| Unclassified (N=2,217) | 1.29 | 0.71 | 0.55 | 1.29 | 2.00 |
| All categories (N=326,826) | 3.39 | 4.42 | 1.31 | 1.69 | 2.00 |

**Note:** size of sub-samples in parentheses

**Table 3.Descriptive Statistics and Overdispersion Characteristics for the Number of Medicines Prescribed Per Beneficiary. Ages Under 65**

| Therapeutic category | Age class | Arithmetic Mean | Standard Deviation | Coefficient of Variation | Mean to Median Ratio | 99th Percentile to 95th Percentile Ratio |
|---|---|---|---|---|---|---|
| Cardiovascular system (N=45,391) | <65 | 4.98 | 5.59 | 1.12 | 1.24 | 1.71 |
| Nervous system (N=16,152) | <65 | 5.59 | 7.25 | 1.30 | 1.86 | 1.88 |
| Alimentary tract and metabolism (N=16,267) | <65 | 2.05 | 2.02 | 0.99 | 1.02 | 1.67 |
| Musculo-skeletal system (N=16,794) | <65 | 1.96 | 1.71 | 0.87 | 0.98 | 1.67 |
| Systemic hormonal preparations (N=10,467) | <65 | 2.72 | 3.05 | 1.12 | 1.36 | 1.75 |
| Antiinfectives for systemic use (N=24,179) | <65 | 1.92 | 1.89 | 0.99 | 1.92 | 2.00 |
| Blood and blood forming organs (N=9,404) | <65 | 4.48 | 5.59 | 1.25 | 2.24 | 2.08 |
| Respiratory system (N=11,633) | <65 | 2.10 | 2.17 | 1.04 | 1.05 | 2.38 |
| Genito-urinary system and sex hormones (N=4,775) | <65 | 1.77 | 1.43 | 0.81 | 0.88 | 1.71 |
| Immune system (N=12,331) | <65 | 1.39 | 0.87 | 0.63 | 1.39 | 1.67 |
| Sensory organs (N=7,447) | <65 | 1.25 | 0.62 | 0.50 | 1.25 | 2.00 |
| Ophthalmologicals (N=3,131) | <65 | 2.21 | 2.28 | 1.03 | 1.10 | 1.78 |
| Dermatologicals (N=6,038) | <65 | 1.71 | 1.36 | 0.80 | 1.71 | 1.75 |
| Antineoplastic and immunomodulating agents (N=1,049) | <65 | 2.68 | 2.77 | 1.03 | 1.34 | 2.00 |
| Unclassified (N=951) | <65 | 1.28 | 0.75 | 0.58 | 1.28 | 2.00 |
| All (N=186,009) | <65 | 2.92 | 4.08 | 1.40 | 1.46 | 2.29 |

**Note**: size of sub-samples in parentheses

**Table 4.Descriptive Statistics and Overdispersion Characteristics for the Number of Medicines Prescribed Per Beneficiary. Ages 65 And Over**

| Therapeutic category | Age class | Arithmetic Mean | Standard Deviation | Coefficient of Variation | Mean to Median Ratio | 99th Percentile to 95th Percentile Ratio |
|---|---|---|---|---|---|---|
| Cardiovascular system (N=27,909) | >=65 | 6.01 | 6.01 | 1.00 | 1.50 | 1.71 |
| Nervous system (N=21,446) | >=65 | 4.74 | 5.83 | 1.23 | 1.58 | 1.88 |
| Alimentary tract and metabolism (N=17,344) | >=65 | 2.27 | 1.97 | 0.87 | 1.14 | 1.67 |
| Musculo-skeletal system (N=15,444) | >=65 | 2.35 | 2.09 | 0.89 | 1.17 | 1.67 |
| Systemic hormonal preparation (N=12,816) | >=65 | 3.09 | 3.21 | 1.04 | 1.54 | 1.75 |
| Antiinfectives for systemic use (N=9,967) | >=65 | 2.17 | 2.69 | 1.24 | 2.17 | 2.00 |
| Blood and blood forming organs (N=7,429) | >=65 | 2.30 | 2.36 | 1.03 | 1.15 | 2.08 |
| Respiratory system (N=7,788) | >=65 | 3.52 | 5.06 | 1.44 | 1.76 | 2.50 |
| Genito-urinary system and sex hormones (N=5,598) | >=65 | 3.23 | 2.67 | 0.83 | 1.61 | 1.71 |
| Immune system (N=3,140) | >=65 | 1.37 | 0.85 | 0.62 | 1.37 | 1.67 |
| Sensory organs (N=2,089) | >=65 | 1.34 | 0.78 | 0.59 | 1.34 | 2.00 |
| Ophthalmologicals (N=5,051) | >=65 | 3.63 | 3.50 | 0.96 | 1.82 | 1.78 |
| Dermatologicals (N=2,356) | >=65 | 1.92 | 1.70 | 0.89 | 1.92 | 1.75 |
| Antineoplastic and immunomodulating agents (N=1,174) | >=65 | 2.41 | 2.07 | 0.86 | 1.20 | 2.00 |
| Unclassified (N=1,266) | >=65 | 1.30 | 0.66 | 0.51 | 1.30 | 2.00 |
| All (N=140,817) | >=65 | 3.88 | 4.70 | 1.21 | 1.94 | 2.00 |

**Note:** size of sub-samples in parentheses

**Table 5. Table of Analysis of Variance of the Number of Medicines Prescribed Per Beneficiary**

| Tests of Between-Subjects Effects. Dependent Variable: Claims | | | | | |
|---|---|---|---|---|---|
| Source of variance | Type III Sum of Squares | Degrees of freedom | Mean Square | F statistic | P-value |
| Corrected Model | 897174.81 | 29 | 30937.06 | 1840.78 | 0.00000000 |
| Intercept | 868913.13 | 1 | 868913.13 | 51700.98 | 0.00000000 |
| Age factor | 1864.36 | 1 | 1864.36 | 110.93 | 0.00000000 |
| Therapeutic category | 708366.78 | 14 | 50597.63 | 3010.60 | 0.00000000 |
| Age factor *Therapeutic category | 62295.87 | 14 | 4449.70 | 264.76 | 0.00000000 |
| Error | 5492300.50 | 326796 | 16.81 | | |
| Total | 10134294.00 | 326826 | | | |
| Corrected Total | 6389475.30 | 326825 | | | |
| R Squared = 0.140 (Adjusted R Squared = 0.140) | | | | | |

**Table 6. Mean Difference between Age Classes, by Therapeutic Category**

| Therapeutic category | Age class | Arithmetic Mean of medicines prescribed |
|---|---|---|
| Cardiovascular system | <65 | 4.98 |
| | >=65 | 6.01** |
| Nervous system | <65 | 5.59** |
| | >=65 | 4.74 |
| Alimentary tract and metabolism | <65 | 2.05 |
| | >=65 | 2.27** |
| Musculo-skeletal system | <65 | 1.96 |
| | >=65 | 2.35** |
| Systemic hormonal preparations | <65 | 2.72 |
| | >=65 | 3.09** |
| Antiinfectives for systemic use | <65 | 1.92 |
| | >=65 | 2.17** |
| Blood and blood forming organs | <65 | 4.48** |
| | >=65 | 2.30 |
| Respiratory system | <65 | 2.10 |
| | >=65 | 3.52** |
| Genito-urinary system and sex hormones | <65 | 1.77 |
| | >=65 | 3.23** |
| Immune system | <65 | 1.39 |
| | >=65 | 1.37 |
| Sensory organs | <65 | 1.25 |
| | >=65 | 1.34** |
| Ophthalmologicals | <65 | 2.21 |
| | >=65 | 3.63** |
| Dermatologicals | <65 | 1.71 |
| | >=65 | 1.92** |
| Antineoplastic and immunomodulating agents | <65 | 2.68** |
| | >=65 | 2.41 |
| Unclassified medicines | <65 | 1.28 |
| | >=65 | 1.30 |
| All therapeutic categories | <65 | 2.92 |
| | >=65 | 3.88** |

** Between-age classes significantly different, at the 1% level

**Table 7. Mean and Standard Error of Age, by Therapeutic Category**

| Therapeutic category | Mean Age | Standard Error of Mean |
|---|---|---|
| Cardiovascular system | 67.28 | 0.05 |
| Nervous system | 64.71 | 0.09 |
| Systemic hormonal preparations | 62.95 | 0.12 |
| Ophthalmologicals | 62.74 | 0.24 |
| Alimentary tract and metabolism | 62.17 | 0.10 |
| Antineoplastic and immunomodulating agents | 61.78 | 0.41 |
| Musculo-skeletal system | 60.47 | 0.10 |
| Genito-urinary system and sex hormones | 60.28 | 0.20 |
| Unclassified | 58.30 | 0.39 |
| Blood and blood forming organs | 57.49 | 0.16 |
| Respiratory system | 51.94 | 0.18 |
| Antiinfectives for systemic use | 47.31 | 0.13 |
| Dermatologicals | 47.03 | 0.25 |
| Sensory organs | 45.00 | 0.22 |
| Immune system | 39.36 | 0.24 |
| All therapeutic categories | 59.00 | 0.04 |

**Table 8. Frequency and Severity Components by Therapeutic Category**

| Therapeutic Category | Frequency statistic | Severity statistic | E(S) | St. Dev. of S | Var(S) |
|---|---|---|---|---|---|
| | (1) | (2) | (3)=(1)*(2) | (4) | (5) |
| Cardiovascular system | 5.36 | 1.21 | 6.47 | 1.75 | 3.1 |
| Nervous system | 4.71 | 1.48 | 6.99 | 2.01 | 4.0 |
| Blood and blood forming organs | 3.22 | 1.14 | 3.68 | 1.65 | 2.7 |
| Ophthalmologicals | 2.93 | 1.01 | 2.96 | 1.30 | 1.7 |
| Systemic hormonal preparations | 2.76 | 1.37 | 3.77 | 1.60 | 2.6 |
| Genito-urinary system and sex hormones | 2.45 | 1.09 | 2.67 | 1.30 | 1.7 |
| Antineoplastic and immunomodulating agents | 2.43 | 4.06 | 9.87 | 3.13 | 9.8 |
| Respiratory system | 2.41 | 1.70 | 4.10 | 1.70 | 2.9 |
| Alimentary tract and metabolism | 2.05 | 1.26 | 2.58 | 1.35 | 1.8 |
| Musculo-skeletal system | 2.04 | 1.20 | 2.45 | 1.39 | 1.9 |
| Antiinfectives for systemic use | 1.86 | 1.18 | 2.20 | 1.75 | 3.1 |
| Dermatologicals | 1.68 | 1.18 | 1.99 | 1.75 | 3.1 |
| Immune system | 1.34 | 1.81 | 2.43 | 1.75 | 3.1 |
| Unclassified | 1.25 | 2.42 | 3.03 | 1.75 | 3.1 |
| Sensory organs | 1.24 | 1.03 | 1.27 | 1.75 | 3.1 |
| All categories | 3.11 | 1.32 | 4.10 | 1.74 | 3.0 |

**Table 9. Frequency and Severity Components by Therapeutic Category; Ages 65 And Over**

| Therapeutic Category | Frequency statistic | Severity statistic | E(S) | St. Dev. of S | Var(S) |
|---|---|---|---|---|---|
| | (1) | (2) | (3)=(1)*(2) | (4) | (5) |
| Cardiovascular system | 5.78 | 1.18 | 6.81 | 5.35 | 28.64 |
| Nervous system | 4.39 | 1.50 | 6.57 | 6.37 | 40.61 |
| Blood and blood forming organs | 2.17 | 1.16 | 2.51 | 2.45 | 6.00 |
| Ophthalmologicals | 3.46 | 1.01 | 3.49 | 2.98 | 8.91 |
| Systemic hormonal preparations | 2.91 | 1.37 | 3.99 | 3.43 | 11.75 |
| Genito-urinary system and sex hormones | 3.08 | 1.11 | 3.41 | 2.65 | 7.02 |
| Antineoplastic and immunomodulating agents | 2.28 | 4.75 | 10.85 | 11.43 | 130.62 |
| Respiratory system | 3.12 | 1.82 | 5.68 | 6.70 | 44.89 |
| Alimentary tract and metabolism | 2.15 | 1.27 | 2.73 | 2.10 | 4.42 |
| Musculo-skeletal system | 2.23 | 1.27 | 2.82 | 2.53 | 6.40 |
| Antiinfectives for systemic use | 1.99 | 1.17 | 2.33 | 1.95 | 3.80 |
| Dermatologicals | 1.80 | 1.17 | 2.10 | 1.62 | 2.63 |
| Immune system | 1.31 | 2.14 | 2.81 | 4.13 | 17.10 |
| Unclassified | 1.27 | 2.33 | 2.96 | 2.13 | 4.52 |
| Sensory organs | 1.28 | 1.04 | 1.34 | 0.69 | 0.48 |
| All categories | 3.59 | 1.33 | 4.77 | 5.25 | 27.59 |

**Table 10. Frequency and Severity Components by Therapeutic Category; Ages Under 65**

| Therapeutic Category | Frequency statistic | Severity statistic | E(S) | St. Dev. of S | Var(S) |
|---|---|---|---|---|---|
| | (1) | (2) | (3)=(1)*(2) | (4) | (5) |
| Cardiovascular system | 4.61 | 1.25 | 5.78 | 5.22 | 27.23 |
| Nervous system | 5.12 | 1.47 | 7.51 | 6.67 | 44.50 |
| Blood and blood forming organs | 4.14 | 1.13 | 4.68 | 5.02 | 25.21 |
| Ophthalmologicals | 2.06 | 1.01 | 2.08 | 1.69 | 2.87 |
| Systemic hormonal preparations | 2.54 | 1.36 | 3.46 | 3.33 | 11.10 |
| Genito-urinary system and sex hormones | 1.69 | 1.06 | 1.79 | 1.30 | 1.68 |
| Antineoplastic and immunomodulating agents | 2.47 | 3.27 | 8.09 | 8.71 | 75.78 |
| Respiratory system | 1.95 | 1.62 | 3.16 | 2.71 | 7.33 |
| Alimentary tract and metabolism | 1.92 | 1.24 | 2.38 | 1.90 | 3.61 |
| Musculo-skeletal system | 1.81 | 1.14 | 2.06 | 1.63 | 2.65 |
| Antiinfectives for systemic use | 1.79 | 1.18 | 2.12 | 1.95 | 3.82 |
| Dermatologicals | 1.62 | 1.19 | 1.92 | 1.42 | 2.01 |
| Immune system | 1.34 | 1.72 | 2.30 | 2.28 | 5.21 |
| Unclassified | 1.22 | 2.49 | 3.03 | 2.14 | 4.58 |
| Sensory organs | 1.22 | 1.02 | 1.25 | 0.56 | 0.31 |
| All categories | 2.62 | 1.31 | 3.42 | 3.96 | 15.67 |