# Prevalence and Causes of Blindness in Urban and Rural Areas of Egypt

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THE PREVALENCE rate of blindness in a community may be taken as an index of the progress of such a community since it, as well as the individual person, bears responsibility for visual care. Education, habits, beliefs, and socioeconomic standards are all factors which determine the importance that a person attaches to his vision and, hence, the degree of care that he gives his eyes. The community also must provide healthy surroundings and attempt to induce good habits through health education and improved socioeconomic conditions. This goal would include, when necessary, providing free medical care for the poor and medically indigent.

If society is to take effective preventive measures to reduce the blindness prevalence rate, it must ascertain not only the populations at greatest risk but also the distribution of the various types and causes of blindness. In this way it may be possible to determine which groups need what type of preventive measures.

The objective of this study was to investigate the prevalence rate and causes of binocular blindness in some urban and rural areas in Egypt and their relationship to age, sex, and environment.

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*Mrs. Helen B. Moorhead, Section on Blindness Statistics, National Eye Institute, reviewed the classification of causes of blindness of those persons found to be blind in this study. Her review insured the comparability of data with those produced by the Model Reporting Area for Blindness Statistics in the United States.*

## Review of Literature

Peretz (*1*) in 1911 examined 5,465 children under 10 years of age. He found 31 were binocularly blind, a rate of 5.7 per 1,000 using a definition of blindness equivalent to 3/200 (1/60) or less. McCallan (*2*), a year later, reported a blindness rate of 6.5 per 1,000 in 43,668 patients of Egyptian Government ophthalmic hospitals, using a criterion of less than 3/200 as indicating blindness. Another report by McCallan (*3*) in 1917 concerned 500,000 patients who had been examined in Government ophthalmic hospitals from 1906 through 1916. A rate of 50.0 per 1,000 for total blindness was reported. In 1922, he (*4*) reported a blindness rate of 45.0 per 1,000 for 8,960 patients examined during 1918. Sorsby (*5*) stated that conjunctivitis caused

82.3 percent of the blindness in Egypt in 1937 based on data in the "Annual Report of the Ophthalmic Hospitals Section of the Egyptian Ministry of the Interior." His definition of blindness was probably based on a visual acuity of less than 3/200 (1/60).

As indicated by the aforementioned studies, previous clinical investigations of blindness prevalence in urban and rural areas in Egypt were based on data collected from patients attending ophthalmic hospitals for treatment. No information, however, was available regarding the population from which these hospital patients were drawn. It is impossible and improper to compare such hospital studies with community studies such as this study, which used scientific sampling methodology.

No community study of the prevalence of blindness in any urban or rural areas in Egypt using appropriate sampling methodology was found in the literature. Nor can data on blindness from Egyptian censuses be used for comparative purposes. In those censuses, data were secured by asking members of the families available at time of questioning whether any of them were blind. No definition of blindness was mentioned by the enumerator.

To many people, the term "blindness" usually means complete or severe loss of vision. The census data could not distinguish and exclude those blind whose vision could be corrected by glasses. In addition, there was no guarantee that the informants knew or would give exact or verifiable data about the blind. Certainly reliable information on the causes of blindness could not be obtained because those classified as blind were not examined.

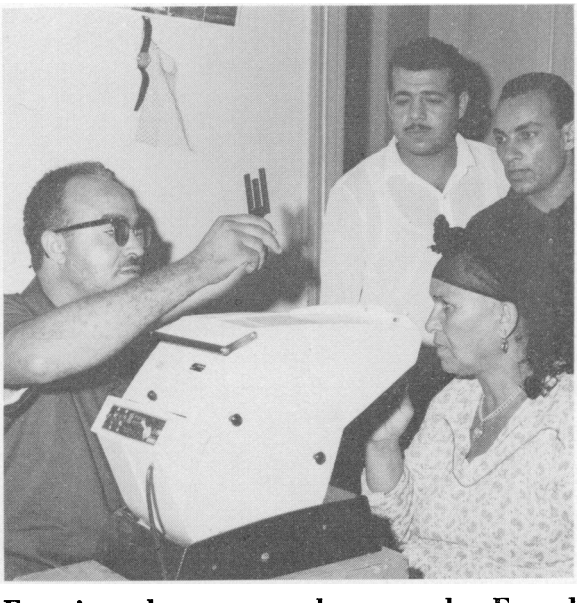
## Methods

*Definition of blindness and sample.* The definition of blindness used in this study is that used by the United States Model Reporting Areas for Blindness Statistics, namely "Visual acuity of 20/200 (6/60) or less in the better eye with best correction, or visual acuity of more than 20/200 if the widest diameter of the field of vision subtends an angle no greater than 20 degrees." (The Model Reporting Area is a group of States in the United States with blindness registers that have voluntarily agreed to a common definition of blindness and to uniform methods of data collection and classification of causes of blindness so that the data secured will be as comparable as possible.)

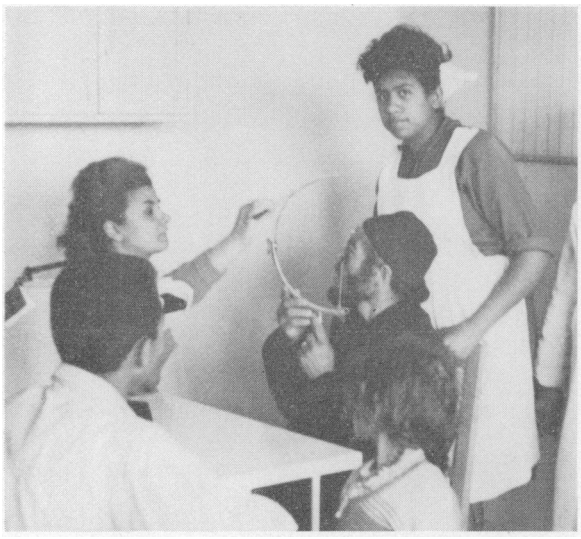
Visual acuity and field of vision were determined by examination of patients by a trained physician or an ophthalmologist. All cases of confirmed blindness were classified by an ophthalmologist as to affection (site and type of blindness) and etiology. "The Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision, developed by the U.S. National Society for the Prevention of Blindness was used.

The urban areas selected for the study consisted of two contiguous districts in Alexandria that contained a representative cross section of persons of various socioeconomic strata. The rural component of the study consisted of 23 villages within a radius of some 20 miles of Alexandria. The urban and rural areas selected each had a population as of April 1965 of about 127,000. The population of the rural sample was determined by local health authority population counts.

We hoped to have approximately 5,000 persons in each of the urban and rural samples. Households, rather than persons, were used as sampling units because it was impossible to secure listings for any locality of persons in the general population. Fortunately, the Alex-



**Examiner shows woman large wooden E used with vision tester**



**Schweigger hand perimeter is used to check field of vision**

andria Department of Social Affairs had complete up-to-date listings of households in Alexandria by districts and subdistricts.

Household is defined as those persons sharing one dwelling unit. Because census data showed that an average Egyptian household consisted of five persons, samples of approximately 1,000 urban households and 1,000 rural households were randomly selected. These households constituted, in effect, a sample of approximately 4 percent from both areas. The two districts selected as the urban sampling frame did not represent Alexandria nor did the 23 villages selected as the rural sampling frame represent all villages in that area or the rural communities of Egypt.

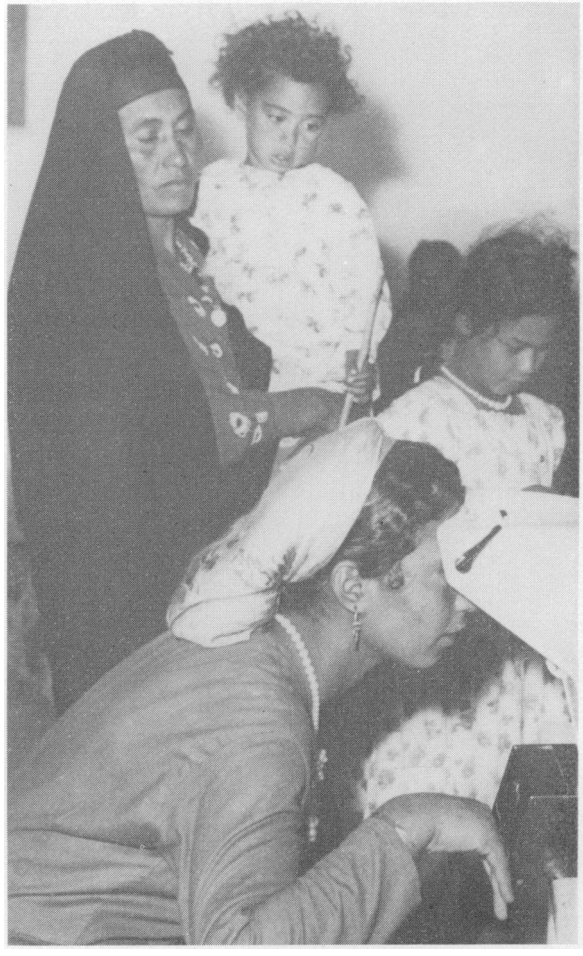
*Equipment*

*Vision tester.* A tester made by the Titmus Optical Company was used to measure visual acuity by means of a tumbling-E slide. This portable equipment is simple to operate and affords complete privacy, complete occlusion, and standardized lighting and distance—something which is not always possible with Snellen or Landolt wall charts. With this equipment, it was possible to distinguish specific gradations of visual acuity from 20/20 to 20/200 inclusive. The tester was operated on a 110-volt power supply, or by dry cell or car batteries if there was no electricity. A transformer was used if the power supply was 220 volts.

*Perimeter.* The Schweigger hand perimeter was used to measure the field of vision. This simple instrument consists of an aluminum arc with a radius of 22 cm., which rotates around a fixed fulcrum, to which is attached a 1 cm. radius plane mirror, used for fixation. A square white target, 3 mm. by 3 mm., is attached to a handle 40 cm. in length. The arc is graduated in degrees from 0° to 90°.

*Trial lenses.* A box of trial lenses containing a set of concave lenses from −0.50 to −10.00 diopters and a set of convex lenses from +0.50 to +10.00 diopters was provided each of the six teams. With these lenses acuity of vision could be corrected to at least 20/100 (6/30). No lenses to correct astigmatism were provided.

*Ophthalmoscope-retinoscope unit.* To examine the fundus oculi, a battery-operated



**Examiner uses vision tester to measure visual acuity**

ophthalmoscope was used; it had an attachment on the battery handle for fastening a retinoscope. The ophthalmoscope was used to inspect the interior of the eye to determine the type and site of the affection. The etiology was determined, if possible, when blindness had been confirmed. The retinoscope was used to estimate the power of the correcting lens and to determine the axes of the cylindrical correction.

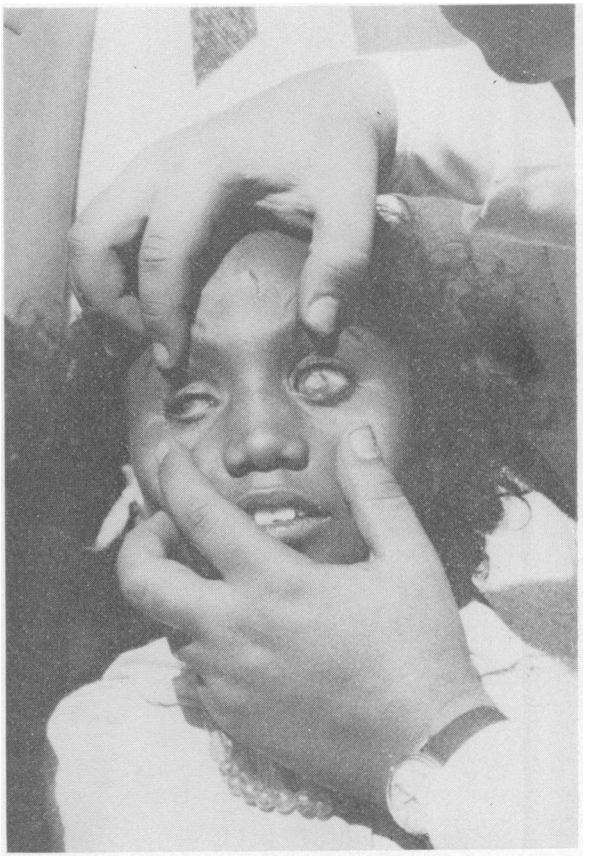
*Procedure*

Each team consisted of a physician (a junior ophthalmologist, if available) to operate the vision tester, perimeter, and ophthalmoscope-retinoscope unit and a social worker to orient persons in the household beforehand concerning the purpose of the study and the examinations to be carried out, to enlist the cooperation of the household, and to record the necessary data on the forms during the examinations. Each team had a porter to carry the equipment from house to house. In addition, an ophthalmologist, serving several teams working in fairly close proximity, was available for consultation, confirmation of blindness, and other necessary duties. An indication of the cooperation given by the households in the sample was that only 19 families in the urban areas and no families in the rural areas refused to cooperate.

Before the examination, the tumbling-E was explained to the examinees. Big tumbling-E charts or a large wooden E were shown to them, and the test was demonstrated. Each eye was examined separately, starting with the right eye. The person was examined with his eyeglasses on if he had any. The best visual acuity of each eye was determined by starting with 20/200 (6/60) and by successive steps to determine the best acuity.

If the better eye had a visual acuity of 20/200 or less, correcting lenses were added after retinoscopy to correct the visual acuity to at least 20/100 (6/30). If the person's visual acuity in the better eye was 20/200 or less with best correction, he was referred to the ophthalmologist as blind, and if confirmed as blind, for diagnosis (affection) and possible determination of the cause.

In most cases, it was impossible to use the vision tester with children under 5 years and, where this was so, they were excluded from the examination. Other persons who had difficulty in understanding what was expected of them were examined clinically by an ophthalmologist, and visual acuity was measured by wall charts.



**Ophthalmologist examines girl whose blindness was caused by corneal opacity following purulent conjunctivitis**

The field of vision was determined only for those whose visual acuity was better than 20/200 in the better eye. The procedure of the test was explained beforehand to the person being tested. For each eye a determination was made of the angle subtended by the widest diameter of the field of vision. If each eye subtended an angle no greater than 20° or if one eye subtended such an angle and the other eye had a visual acuity of 20/200 or less, such persons were referred to the ophthalmologist as blind.

*Reliability Tests*

During most of the project, six teams were in the field. Some provision, therefore, had to be made to determine variability in testing visual

acuity and field of vision among vision screening personnel and among ophthalmologists. Attempts were made before and during the project, as personnel changed, to train the staff in use of the equipment so that methodology would be standardized. Such training did not completely eliminate variability, and monthly tests of reliability for the screening personnel were held. Each month 10 nonblind persons were selected and examined independently by the vision screeners who did not have access to previous records.

The percentage of agreement to determine reliability was computed for each individual screener and an average of such percentages obtained. We decided before starting the study that the degree of agreement among screening personnel should be not less than 80 percent for the same group of persons. If any screener tended to approach this lower limit the reason was immediately ascertained, and additional training was given if necessary.

Similar steps were taken periodically to determine the reliability of the ophthalmologists to arrive at affection and etiology of persons confirmed as blind. Ten blind persons were selected and examined independently by the ophthalmologists who did not have access to previously documented clinical histories or examinations. The percentage of agreement was computed for each ophthalmologist, and an average of such percentages was obtained. The lower limit of agreement on diagnoses was 90 percent.

The periodic reliability tests resulted in a degree of agreement above the minimum and were regarded as satisfactory.

### *False Positives and False Negatives*

All persons screened as blind were referred to the ophthalmologist for confirmation. If not confirmed as blind, the person was considered a false positive. Sixty-five persons or 1.7 percent of those examined in the urban areas were considered false positives, and 129 or 2.2 percent of those examined in the rural areas. The screen-

**Table 1. Persons examined in urban and rural areas, by age and sex**

| Age in years | Urban | | | Rural | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Both sexes | Male | Female | Both sexes | Male | Female | Both sexes |
| Under 10 | 348 | 381 | 729 | 364 | 309 | 673 | 712 | 690 | 1, 402 |
| 10–19 | 698 | 994 | 1, 692 | 899 | 827 | 1, 726 | 1, 597 | 1, 821 | 3, 418 |
| 20–29 | 259 | 539 | 798 | 353 | 528 | 881 | 612 | 1, 067 | 1, 679 |
| 30–39 | 260 | 491 | 751 | 458 | 634 | 1, 092 | 718 | 1, 125 | 1, 843 |
| 40–49 | 240 | 300 | 540 | 396 | 328 | 724 | 636 | 628 | 1, 264 |
| 50–59 | 167 | 203 | 370 | 249 | 206 | 455 | 416 | 409 | 823 |
| 60 or older | 115 | 154 | 269 | 160 | 124 | 284 | 275 | 278 | 555 |
| Total | 2, 087 | 3, 062 | 5, 149 | 2, 879 | 2, 956 | 5, 835 | 4, 966 | 6, 018 | 10, 984 |

**Table 2. Persons examined and confirmed as blind in urban and rural areas, by age and sex**

| Age in years | Urban | | | Rural | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Both sexes | Male | Female | Both sexes | Male | Female | Both sexes |
| Under 10 | 2 | 0 | 2 | 2 | 1 | 3 | 4 | 1 | 5 |
| 10–19 | 1 | 2 | 3 | 5 | 8 | 13 | 6 | 10 | 16 |
| 20–29 | 0 | 0 | 0 | 5 | 4 | 9 | 5 | 4 | 9 |
| 30–39 | 2 | 5 | 7 | 6 | 15 | 21 | 8 | 20 | 28 |
| 40–49 | 3 | 5 | 8 | 7 | 19 | 26 | 10 | 24 | 34 |
| 50–59 | 6 | 12 | 18 | 23 | 50 | 73 | 29 | 62 | 91 |
| 60 or older | 11 | 24 | 35 | 41 | 67 | 108 | 52 | 91 | 143 |
| Total | 25 | 48 | 73 | 89 | 164 | 253 | 114 | 212 | 326 |

ing personnel had been instructed that it was more desirable to err on the side of overreferral than on the side of underreferral and risk missing a case of blindness.

After a given urban or rural area had been screened by a team, a 10 percent random sample of those considered nonblind were reexamined by another team as soon as possible, preferably the next day, to determine whether any blind persons had been missed by the screening test. Not a single such false negative was discovered, possibly because the false negatives would come, if at all, from the category of persons with 20/100 visual acuity in the better eye. This category

**Table 3. Blindness prevalence and rates for affection groups by urban and rural residence and sex**

| Major affection group [1] | Male | | | Female | | | Both sexes | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Rate per 1,000 | Number | Percent | Rate per 1,000 | Number | Percent | Rate per 1,000 |
| Urban total | 25 | 100.0 | 12.0 | 48 | 100.0 | 15.7 | 73 | 100.0 | 14.2 |
| Glaucoma (excluding congenital) | 1 | 4.0 | 0.5 | 3 | 6.2 | 1.0 | 4 | 5.5 | .8 |
| Myopia | 4 | 16.0 | 1.9 | 5 | 10.4 | 1.6 | 9 | 12.3 | 1.7 |
| Keratitis | 8 | 32.0 | 3.8 | 15 | 31.2 | 4.9 | 23 | 31.5 | 4.5 |
| Cataract | 9 | 36.0 | 4.3 | 18 | 37.5 | 5.9 | 27 | 37.0 | 5.2 |
| Uveitis | 0 | | | 1 | 2.1 | .3 | 1 | 1.4 | .2 |
| Retinal degeneration | 0 | | | 1 | 2.1 | .3 | 1 | 1.4 | .2 |
| Other retinal affections | 1 | 4.0 | .5 | 2 | 4.2 | .7 | 3 | 4.1 | .6 |
| Optic nerve atrophy | 1 | 4.0 | .5 | 2 | 4.2 | .7 | 3 | 4.1 | .6 |
| Unknown or not reported | 1 | 4.0 | .5 | 1 | 2.1 | .3 | 2 | 2.7 | .4 |
| Rural total | 89 | 100.0 | 30.9 | 164 | 100.0 | 55.5 | 253 | 100.0 | 43.4 |
| Glaucoma (excluding congenital) | 8 | 9.0 | 2.8 | 10 | 6.1 | 3.4 | 18 | 7.1 | 3.1 |
| Keratitis | 44 | 49.4 | 15.3 | 94 | 57.3 | 31.8 | 138 | 54.5 | 23.6 |
| Cataract | 28 | 31.5 | 9.7 | 57 | 34.8 | 19.3 | 85 | 33.6 | 14.6 |
| Uveitis | 1 | 1.1 | .3 | 0 | | | 1 | .4 | .2 |
| Retinal degeneration | 3 | 3.4 | 1.0 | 0 | | | 3 | 1.2 | .5 |
| Other retinal affections | 1 | 1.1 | .4 | 0 | | | 1 | .4 | .2 |
| Optic nerve atrophy | 3 | 3.4 | 1.0 | 0 | | | 3 | 1.2 | .5 |
| All other affections | 1 | 1.1 | .4 | 3 | 1.8 | 1.0 | 4 | 1.6 | .7 |

[1] "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

**Table 4. Blindness prevalence and rates for etiology groups by urban and rural residence and sex**

| Major etiology group [1] | Male | | | Female | | | Both sexes | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent | Rate per 1,000 | Number | Percent | Rate per 1,000 | Number | Percent | Rate per 1,000 |
| Urban total | 25 | 100.0 | 12.0 | 48 | 100.0 | 15.7 | 73 | 100.0 | 14.2 |
| Infectious diseases | 8 | 32.0 | 3.8 | 15 | 31.2 | 4.9 | 23 | 31.5 | 4.5 |
| Diabetes | 1 | 4.0 | .5 | 2 | 4.2 | .7 | 3 | 4.1 | .6 |
| Senile degeneration | 9 | 36.0 | 4.3 | 18 | 37.5 | 5.9 | 27 | 37.0 | 5.2 |
| Prenatal influence | 1 | 4.0 | .5 | 1 | 2.1 | .3 | 2 | 2.7 | .4 |
| Unknown to science | 1 | 4.0 | .5 | 3 | 6.2 | 1.0 | 4 | 5.5 | .8 |
| Not reported or determined | 5 | 20.0 | 2.4 | 9 | 18.8 | 2.9 | 14 | 19.2 | 2.7 |
| Rural total | 89 | 99.9 | 30.9 | 164 | 100.0 | 55.5 | 253 | 100.0 | 43.4 |
| Infectious diseases | 44 | 49.4 | 15.3 | 94 | 57.3 | 31.8 | 138 | 54.5 | 23.6 |
| Injuries, poisoning | 0 | | | 2 | 1.2 | .7 | 2 | .8 | .3 |
| Senile degeneration | 27 | 30.3 | 9.4 | 55 | 33.6 | 18.6 | 82 | 32.4 | 14.1 |
| Vascular diseases | 1 | 1.1 | .3 | | | | 1 | .4 | .2 |
| Prenatal influence | 5 | 5.6 | 1.7 | 3 | 1.8 | 1.0 | 8 | 3.2 | 1.4 |
| Unknown to science | 8 | 9.0 | 2.8 | 10 | 6.1 | 3.4 | 18 | 7.1 | 3.1 |
| Not reported or determined | 4 | 4.5 | 1.4 | | | | 4 | 1.6 | .7 |

[1] "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

formed a small proportion (about 4.5 percent in urban areas and 10.7 percent in rural areas) of the persons examined, and a 10 percent sample for checkup would make the number even smaller. Also, the examiners tended to be cautious, as mentioned previously, and, if in doubt, would refer all borderline cases to the ophthalmologist who was always available in the field at the time of examination.

### Results

Table 1 shows the distribution of persons by age and sex whose eyes were examined in urban and rural areas. The great majority of children tabulated who were under 10 years of age were really in the age group 5–9 years because few under 5 were able to cooperate. Approximately 40 percent of those examined in urban areas were males and about 60 percent females. Traditionally, females are more homebound than males in urban areas. In the age groups 10–19, 20–29, and 30–39 years, the disparity between the number of males and females examined was even greater.

More females were examined than males in urban areas but not in rural areas, except in the age groups 20–29 and 30–39 years. Of those examined in rural areas, about 49 percent were males and 51 percent females. In the rural areas for whatever reason, more men were available for examination than in the urban areas.

Table 2 gives the distribution by age and sex in urban and rural areas of the 326 persons confirmed as blind by the definition used in the study. As expected, the blind came principally from the older groups. For example, the 60 years and older group represented only 5 percent of the population surveyed in urban areas and a similar percent of that surveyed in the rural areas (table 1), yet it contributed approximately 48 percent of the urban blind and 43 percent of the rural blind (table 2). The age group under 20 years contributed 47 percent to the urban population and 41 percent to the rural population, yet accounted for only about 7 percent of the urban blind and 6 percent of the rural blind.

**Table 5. Blindness prevalence rates for affection groups by age and sex of urban residents per 1,000 persons examined**

| Age in years | Glaucoma (excluding congenital) | Myopia | Keratitis | Cataract | Uveitis | Retinal degeneration | Other retinal affections | Optic nerve atrophy | Unknown or not reported | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Males | 0.5 | 1.9 | 3.8 | 4.3 | | | 0.5 | 0.5 | 0.5 | 12.0 |
| Under 10 | | | 2.9 | | | | | | 2.9 | 5.8 |
| 10–19 | | | | | | | | 1.4 | | 1.4 |
| 20–29 | | | | | | | | | | |
| 30–39 | | 3.8 | 3.8 | | | | | | | 7.6 |
| 40–49 | | 4.2 | 4.2 | 4.2 | | | | | | 12.6 |
| 50–59 | 6.0 | 6.0 | 12.0 | 6.0 | | | 6.0 | | | 36.0 |
| 60 or older | | 8.7 | 26.1 | 60.9 | | | | | | 95.7 |
| Females | 1.0 | 1.6 | 4.9 | 5.9 | 0.3 | 0.3 | 0.7 | 0.7 | 0.3 | 15.7 |
| Under 10 | | | | | | | | | | |
| 10–19 | | | | | | 1.0 | | 1.0 | | 2.0 |
| 20–29 | | | | | | | | | | |
| 30–39 | | | 8.1 | | | | | | 2.0 | 10.1 |
| 40–49 | 3.3 | | 6.7 | 3.3 | | | | 3.3 | | 16.6 |
| 50–59 | 4.9 | 14.8 | 19.7 | 19.7 | | | | | | 59.1 |
| 60 or older | 6.5 | 13.0 | 32.5 | 84.4 | 6.5 | | 13.0 | | | 155.9 |
| Both sexes | 0.8 | 1.7 | 4.5 | 5.2 | 0.2 | 0.2 | 0.6 | 0.6 | 0.4 | 14.2 |
| Under 10 | | | 1.4 | | | | | | 1.4 | 2.8 |
| 10–19 | | | | | | 0.6 | | 1.2 | | 1.8 |
| 20–29 | | | | | | | | | | |
| 30–39 | | 1.3 | 6.7 | | | | | | 1.3 | 9.3 |
| 40–49 | 1.8 | 1.8 | 5.6 | 3.7 | | | | 1.8 | | 14.9 |
| 50–59 | 5.4 | 10.8 | 16.2 | 13.5 | | | 2.7 | | | 48.6 |
| 60 or older | 3.7 | 11.2 | 29.7 | 74.3 | 3.7 | | 7.4 | | | 130.0 |

NOTE: Classifications are those of the "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

Table 3 presents blindness prevalence rates per 1,000 persons examined for major affection groups by urban or rural residence and sex. These rates should be age-adjusted for more meaningful comparisons. The blindness prevalence rate for rural males was two and a half times that for urban males; for rural females, the rate was almost four times that of the urban rate. In urban areas, the blindness prevalence rate for females was about 30 percent greater then that for males; in rural areas, the rate for females was some 80 percent greater than the rate of males. For every affection indicated, the rate for rural females exceeded that of the males.

In urban areas, the cataract prevalence rate is the highest for any affection in males or females. In the rural areas, this dubious honor was claimed by keratitis, which accounted for 57 percent of all female affections and about 50 percent of all male affections. Almost all cases of keratitis were, in fact, corneal ulcers. Among females, glaucoma, keratitis, and cataract accounted for practically all cases of blindness. Keratitis and cataract accounted for about 69 percent of the urban blind and 88 percent of the rural blind. In the rural areas, these two affections were responsible for 81 percent of the blindness of males and 92 percent of the blindness of females.

Myopia was not responsible for even a single case of blindness in rural areas, although it was third in order of magnitude as a cause of blindness in urban areas. Probably infection and its resulting corneal opacities made it difficult to detect the presence of myopia.

In table 4 are shown blindness prevalence rates per 1,000 persons examined for major etiology groups by urban or rural residence and sex. As in the prevalence rates for affections, these rates should also be age-adjusted for more meaningful comparisons. The blindness prevalence rate for senile degeneration was the highest for any etiology in urban males or females. This high rate was not surprising because almost all cases of cataract were considered to have senile degeneration as the etiology. In the rural areas, infectious diseases

**Table 6. Blindness prevalence rates for affection groups by age and sex of rural residents per 1,000 persons examined**

| Age in years | Glaucoma (excluding congenital) | Keratitis | Cataract | Uveitis | Retinal degeneration | Other retinal affections | Optic nerve atrophy | All other affections | Total |
|---|---|---|---|---|---|---|---|---|---|
| Males | 2.8 | 15.3 | 9.7 | 0.3 | 1.0 | 0.4 | 1.0 | 0.4 | 30.9 |
| Under 10 | | 2.7 | | | | | 2.7 | | 5.4 |
| 10–19 | | 1.1 | | 1.1 | | | 2.2 | 1.1 | 5.5 |
| 20–29 | | 11.3 | | | 2.8 | | | | 14.1 |
| 30–39 | | 13.1 | | | | | | | 13.1 |
| 40–49 | | 17.7 | | | | | | | 17.7 |
| 50–59 | 12.0 | 56.2 | 16.1 | | 8.0 | | | | 92.3 |
| 60 or older | 31.2 | 68.8 | 150.0 | | | 6.2 | | | 256.4 |
| Females | 3.4 | 31.8 | 19.3 | | | | | 1.0 | 55.5 |
| Under 10 | | 3.2 | | | | | | | 3.2 |
| 10–19 | | 7.3 | 1.2 | | | | | 1.2 | 9.7 |
| 20–29 | | 7.6 | | | | | | | 7.6 |
| 30–39 | | 20.5 | 3.2 | | | | | | 23.7 |
| 40–49 | 3.0 | 42.7 | 9.1 | | | | | 3.0 | 57.8 |
| 50–59 | 19.4 | 131.1 | 92.2 | | | | | | 242.7 |
| 60 or older | 40.3 | 233.9 | 258.1 | | | | | 8.1 | 540.4 |
| Both sexes | 3.1 | 23.6 | 14.6 | 0.2 | 0.5 | 0.2 | 0.5 | 0.7 | 43.4 |
| Under 10 | | 3.0 | | | | | 1.5 | | 4.5 |
| 10–19 | | 4.1 | .6 | .6 | | | 1.2 | 1.2 | 7.7 |
| 20–29 | | 9.1 | | | 1.1 | | | | 10.2 |
| 30–39 | | 17.4 | 1.8 | | | | | | 19.2 |
| 40–49 | 1.4 | 29.0 | 4.1 | | | | | 1.4 | 35.9 |
| 50–59 | 15.4 | 90.1 | 50.5 | | 4.4 | | | | 160.4 |
| 60 or older | 35.2 | 140.8 | 197.2 | | | 3.5 | | 3.5 | 380.3 |

NOTE: Classifications are those of "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

**Table 7. Blindness prevalence rates for etiology groups by age and sex of urban residents per 1,000 persons examined**

| Age in years | Infectious diseases | Diabetes | Senile degeneration | Prenatal influence | Unknown to science | Not reported or determined | Total |
|---|---|---|---|---|---|---|---|
| Males | 3.8 | 0.5 | 4.3 | 0.5 | 0.5 | 2.4 | 12.0 |
| Under 10 | 2.9 | | | | | 2.9 | 5.8 |
| 10–19 | | | | | | 1.4 | 1.4 |
| 20–29 | | | | | | | |
| 30–39 | 3.8 | | | | | 3.8 | 7.6 |
| 40–49 | 4.2 | | 4.2 | | | 4.2 | 12.6 |
| 50–59 | 12.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 36.0 |
| 60 and over | 26.1 | | 60.9 | 8.7 | | | 95.7 |
| Females | 4.9 | .7 | 5.9 | .3 | 1.0 | 2.9 | 15.7 |
| Under 10 | | | | | | | |
| 10–19 | | | | 1.0 | | 1.0 | 2.0 |
| 20–29 | | | | | | | |
| 30–39 | 8.1 | | | | | 2.0 | 10.1 |
| 40–49 | 6.7 | | 3.3 | | 3.3 | 3.3 | 16.6 |
| 50–59 | 19.7 | | 19.7 | | 4.9 | 14.8 | 59.1 |
| 60 and over | 32.5 | 13.0 | 84.4 | | 6.5 | 19.5 | 155.9 |
| Both sexes | 4.5 | .6 | 5.2 | .4 | .8 | 2.7 | 14.2 |
| Under 10 | 1.4 | | | | | 1.4 | 2.8 |
| 10–19 | | | | .6 | | 1.2 | 1.8 |
| 20–29 | | | | | | | |
| 30–39 | 6.7 | | | | | 2.7 | 9.3 |
| 40–49 | 5.6 | | 3.7 | | 1.9 | 3.7 | 14.9 |
| 50–59 | 16.2 | 2.7 | 13.5 | | 5.4 | 10.8 | 48.6 |
| 60 and over | 29.7 | 7.4 | 74.3 | 3.7 | 3.7 | 11.2 | 130.0 |

NOTE: Classifications are those of "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

had the highest prevalence rates for either sex. Since infectious diseases, including trachoma, constituted the etiology for the great majority of the keratitic blind, this discovery is also not surprising, particularly since the leading affection in the rural areas was keratitis.

From table 5 it is seen that, in general, wherever sufficient data are available, there is an increase in age-specific prevalence rates with age for the affections in the urban areas. This increase is true for both males and females. For all affections combined, the first appreciable rate increases occurred in the age group 30–39 years, mainly because of the increasing occurrence of keratitic blindness.

Table 6 shows that in the rural areas also the age-specific rates for each sex increased with age. The first appreciable increases occurred earlier in the rural areas than in the urban ones, mainly because of the increased prevalence of blindness caused by keratitis. In males the earliest age group showing a marked increase was the 20–29 year group while in females it was the 10–19 year group.

The prevalence rates of blindness by etiology and by sex and age are shown in table 7 for the urban areas and in table 8 for the rural areas. These tables reflect the etiological antecedents of the affections tabulated by age and sex for urban and rural areas in tables 5 and 6. The older age groups are those most affected in urban and rural areas. It is evident that senile degeneration played an important role. Infectious diseases caused blindness during the youth of these older persons—some 30 years ago—before the mass use of sulphonamides and antibiotics in the treatment of ophthalmias in Egypt. Infectious diseases are presently prevalent, however, among the younger populations in the rural areas.

Statistical significance of the results of the study was tested with the $t$-test at the 5 percent level. Table 9 shows the differences in blindness prevalence rates between males and females, and between urban and rural residents by major affection groups. In the urban areas there was no significant difference between rates for males and females for any affection group. In the rural

areas, the rates for females were significantly greater than the rates for males for keratitis and cataract.

The myopia rate among urban males significantly exceeded the myopia rate among rural males. As a matter of fact, no myopia blindness was observed among rural males. Similarly, the keratitis rate among rural males greatly exceeded that of urban males, presumably because of the greater incidence of trachoma in rural areas. As with males, the rate of myopia among urban females was significantly greater than that of the rural females. Again, no blind were found among the myopic rural females. As with males, the keratitis blindness rate of rural females greatly exceeded that of urban females. Finally, the cataract rate for rural females was significantly greater than that of urban females.

Table 10 reflects the etiology of what, to a large extent, was shown for affections in table 9. Prevalence rates for females for infectious diseases and for senile degeneration in the rural areas are about double those of males and the differences were statistically significant. Rates for infectious diseases and senile degeneration among rural males considerably exceeded those for urban males. Similarly, rates for infectious diseases and senile degeneration for rural females were significantly greater than similar rates for urban females. It is not clear why there were nine blind urban females with etiology not reported or determined while none were reported in the rural areas.

## Discussion

Blindness is and, apparently always has been, a problem in Egypt. Despite this fact, meaningful statistics on prevalence rates by age, sex, and cause, based on community surveys, have been lacking to date. Before our study the two major sources of data on blindness in Egypt were the census and studies of ophthalmic patients. In the census statistics, the lack of definition, verifiable data, and cause of blindness were serious drawbacks to acceptance of these data. In the

**Table 8. Blindness prevalence rates for etiology groups by age and sex of rural residents per 1,000 persons examined**

| Age in years | Infectious diseases | Injuries, poisonings | Senile degeneration | Vascular diseases | Prenatal influence | Unknown to science | Not reported or determined | Total |
|---|---|---|---|---|---|---|---|---|
| Males | 15.3 | ---------- | 9.4 | 0.3 | 1.7 | 2.8 | 1.4 | 30.9 |
| Under 10 | 2.7 | ---------- | ---------- | ---------- | ---------- | ---------- | 2.7 | 5.4 |
| 10–19 | 1.1 | ---------- | ---------- | ---------- | 2.2 | ---------- | 2.2 | 5.5 |
| 20–29 | 11.3 | ---------- | ---------- | ---------- | 2.8 | ---------- | ---------- | 14.1 |
| 30–39 | 13.1 | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 13.1 |
| 40–49 | 17.7 | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 17.7 |
| 50–59 | 56.2 | ---------- | 12.0 | ---------- | 8.0 | 12.0 | 4.0 | 92.3 |
| 60 and over | 68.8 | ---------- | 150.0 | 6.3 | ---------- | 31.3 | ---------- | 256.4 |
| Females | 31.8 | 0.7 | 18.6 | ---------- | 1.0 | 3.4 | ---------- | 55.5 |
| Under 10 | 3.2 | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 3.2 |
| 10–19 | 7.3 | 1.2 | ---------- | ---------- | 1.2 | ---------- | ---------- | 9.7 |
| 20–29 | 7.6 | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 7.6 |
| 30–39 | 20.5 | ---------- | 1.6 | ---------- | 1.6 | ---------- | ---------- | 23.7 |
| 40–49 | 42.7 | ---------- | 9.1 | ---------- | 3.0 | 3.0 | ---------- | 57.8 |
| 50–59 | 126.2 | ---------- | 97.1 | ---------- | ---------- | 19.4 | ---------- | 242.7 |
| 60 and over | 241.9 | 8.1 | 250.0 | ---------- | ---------- | 40.3 | ---------- | 540.4 |
| Both sexes | 23.6 | .3 | 14.1 | .2 | 1.4 | 3.1 | .7 | 43.4 |
| Under 10 | 3.0 | ---------- | ---------- | ---------- | ---------- | ---------- | 1.5 | 4.5 |
| 10–19 | 4.1 | .6 | ---------- | ---------- | 1.7 | ---------- | 1.2 | 7.7 |
| 20–29 | 9.1 | ---------- | ---------- | ---------- | 1.1 | ---------- | ---------- | 10.2 |
| 30–39 | 17.4 | ---------- | .9 | ---------- | .9 | ---------- | ---------- | 19.2 |
| 40–49 | 29.0 | ---------- | 4.1 | ---------- | 1.4 | 1.4 | ---------- | 35.9 |
| 50–59 | 87.9 | ---------- | 50.5 | ---------- | 4.4 | 15.4 | 2.2 | 160.4 |
| 60 and over | 144.4 | 3.5 | 193.7 | 3.5 | ---------- | 35.2 | ---------- | 380.3 |

NOTE: Classifications are those of "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.

**Table 9. Differences in blindness prevalence rates per 1,000 persons examined between males and females and between urban and rural areas, by major affection groups**

| Major affection groups [1] | Difference between male and female rates [2] | | Difference between urban and rural rates [3] | |
|---|---|---|---|---|
| | Urban | Rural | Male | Female |
| Glaucoma (excluding congenital) | −0.5 | −0.6 | −2.3 | −2.4 |
| Myopia | .3 | ---------- | [4] 1.9 | [4] 1.6 |
| Keratitis | −1.1 | [4] −16.5 | [4] −11.5 | [4] −26.9 |
| Cataract | −1.6 | [4] −9.6 | −5.4 | [4] −13.4 |
| Uveitis | −.3 | .3 | −.3 | .3 |
| Retinal degeneration | −.3 | 1.0 | −1.0 | .3 |
| Other retinal affections | −.2 | .4 | .1 | .7 |
| Optic nerve atrophy | −.2 | 1.0 | −.5 | .7 |
| Unknown or not reported | −.2 | ---------- | .5 | .3 |
| All other affections | ---------- | −.6 | −.4 | −1.0 |
| Total | −3.7 | [4] −24.6 | [4] −18.9 | [4] −39.8 |

[1] "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.
[2] Minus sign indicates female rates exceed male rates.
[3] Minus sign indicates rural rates exceed urban rates.
[4] Statistically significant at the 5 percent level.

studies of ophthalmic patients, the lack of a defined population from which patients were drawn make it impossible to determine representativeness of the data or to compute rates.

This study, the first of its kind in the world, avoided the aforementioned deficiencies. Persons were examined in their homes using portable equipment, thus minimizing the possibility of missing the old and bedridden, who are likely to have the highest rates of vision disorders. These two groups are usually underrepresented among persons examined at clinics and hospitals.

The data would seem to indicate that blindness prevalence rates among females are not much higher than rates for males in urban areas but are significantly higher in rural areas, probably because of the increased keratitis and cataract prevalence among females in such areas. Keratitis in practically all persons is evident as a corneal ulcer, which is secondary to epidemic seasonal mucopurulent and purulent conjunctivitis-ophthalmias. Such ophthalmias are completely preventable.

The introduction of the sulphonamides and other chemotherapeutic agents and antibiotics has succeeded in preventing a considerable proportion of these ophthalmias in the last 30 years. Improved sanitation and socioeconomic conditions have had considerable impact in reducing blindness. In every case of blindness associated with keratitis, with trachoma as the infectious disease, there was also an associated conjunctivitis. Without such conjunctivitis, trachoma was much less likely to result in blindness.

Although rates for cataract were higher among both males and females in rural areas than they were in urban areas, the rate among the rural females was considerably higher than the rate for rural males. The reason for this higher rate among females was not clear. Preventive measures for cataract are unknown at

**Table 10. Differences in blindness prevalence rates per 1,000 persons examined between males and females and between urban and rural areas, by major etiology groups**

| Major etiology groups [1] | Difference between male and female rates [2] | | Difference between urban and rural rates [3] | |
|---|---|---|---|---|
| | Urban | Rural | Male | Female |
| Infectious diseases | −1.1 | [4] −16.5 | [4] −11.5 | [4] −26.9 |
| Injuries, poisonings | ---------- | −.7 | ---------- | −.7 |
| Diabetes | −.2 | ---------- | .5 | .7 |
| Senile degeneration | −1.6 | [4] −9.2 | [4] −5.1 | [4] −12.7 |
| Vascular diseases | ---------- | .3 | −.3 | ---------- |
| Prenatal influence | .2 | .7 | −1.2 | −.7 |
| Unknown to science | −.5 | −.6 | −2.3 | −2.4 |
| Not reported or determined | −.5 | 1.4 | 1.0 | [4] 2.9 |
| Total | −3.7 | [4] −24.6 | [4] −18.9 | [4] −39.8 |

[1] "Standard Classification of Causes of Severe Vision Impairment and Blindness," 1965 revision.
[2] Minus sign indicates female rates exceed male rates.
[3] Minus sign indicates rural rates exceed urban rates.
[4] Statistically significant at the 5 percent level.

present, but surgery is practically 100 percent effective therapeutically. Therefore, cataract should not be considered as a cause of permanent blindness.

For both males and females, myopia rates were higher in urban areas than in rural ones. As a matter of fact, no cases of myopia were diagnosed in rural areas. This lack of cases is considered an artifact on the presumption that trachoma infection with associated conjunctivitis and its resulting corneal opacities probably make it difficult to detect myopia.

As discovered in studies in other countries, there is, in general, an increase in rates for every affection investigated with increasing age. The age-specific rates were especially high in the oldest age groups for keratitis and cataract in both urban and rural areas and, in addition, for glaucoma in the rural areas. It should be remembered that the nonexistence of sulphonamides and other antibiotics 30 or more years ago may explain the high rates of keratitis in the older populations now.

The rate of blindness in the younger age groups is greatly reduced in both rural and urban areas (about one-twelfth the rate of those 20 years and older). One is tempted to conclude that older persons, especially in rural areas, did not receive the proper medical care at the proper time. This lack of care may be due either to a lack of medical facilities in the village and nearby areas or to the difficulty in traveling to the nearest medical facility. In addition, poverty, together with a low educational level and unsanitary habits, played their role in producing the comparatively high rates of blindness in rural areas. Some known facts noted in this study regarding the etiologies of the conditions of blindness were that keratitis is usually related causally to infectious diseases, cataract to senile degeneration, and glaucoma to etiology unknown to science. Thus, the etiological rates mirror those for the affections mentioned.

Blindness can be greatly reduced if eye infections are treated promptly. From the observations resulting from this study, it is evident that proper eye treatment, medication, or surgery should be available for all persons with eye conditions, particularly for those persons living in remote places. This preventive care is especially important since a fair proportion of persons could have their eyesight saved if such treatment were available.

Eye hygiene was not receiving adequate attention either from the public or from health authorities some 20 years ago. Thus, prevention was to a large extent being neglected at great risk. This lack of attention emphasizes the need for a good program of health education for protection of the eye and preservation of eyesight for all age groups in all countries. Intensive efforts to achieve this goal have been made in Egypt in recent years.


## Summary

A house-to-house survey of a 4 percent random sample of households in urban and rural areas in and around Alexandria, Egypt, was conducted. This sample consisted of approximately 11,000 persons of all ages and socioeconomic levels. Attempts were made to examine all members of such households for visual acuity with best correction and, where appropriate, for field of vision. A total of 326 persons had diagnoses of blindness confirmed by an ophthalmologist.

No significant difference in specific affection or etiology prevalence rates in urban areas was observed between males and females.

Significant differences were noted in the rates between males and females for all affections combined or for all etiologies combined and specifically for keratitis (infectious diseases) and cataract (senile degeneration) prevalence rates in the rural areas. In these affections, rates among females exceeded those of males.

Significant differences for males were observed between urban and rural blindness prevalence rates for all affections combined and specifically for myopia (prenatal influence and unknown) and keratitis (infectious diseases) prevalence rates; in all these affections, except myopia, rural rates exceeded urban rates.

There were significant differences for females between urban and rural rates for all affections combined or for all etiologies combined. Rural rates exceeded urban rates for keratitis (infectious diseases) and for cataract (senile degeneration). For myopia (prenatal influence and unknown) the reverse was true.

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**Tearsheet Requests**

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# Dr. Vernon E. Wilson Heads HSMHA

Dr. Vernon E. Wilson, named Administrator of the Health Services and Mental Health Administration (HSMHA) by DHEW Secretary Robert H. Finch, assumed his new duties on July 1, 1970. He succeeded Dr. Joseph T. English, who resigned to become first president of the New York City Health and Hospitals Corporation.

Before his appointment, Dr. Wilson was vice president for academic affairs at the University of Missouri, Columbia. Before moving to that post he had been executive director for health affairs at the university. As administrator of HSMHA, he directs one of four major operating agencies of DHEW under the jurisdiction of Dr. Roger O. Egeberg, Assistant Secretary for Health and Scientific Affairs. HSMHA provides principal thrust to the Federal Government's efforts to improve organization and delivery of health care in the United States. It operates on an annual budget of more than $1 billion.

A native of Iowa, Dr. Wilson was born February 16, 1915, in Plymouth County. He served with the U.S. Naval Reserve from 1943 to 1946. He received his B.S. degree in 1950 and a master's degree in pharmacology and an M.D. in 1952 from the University of Illinois at Urbana. From 1950 to 1952, Dr. Wilson was an assistant in the School of Pharmacology at the University of Illinois, and from 1953 to 1959 he was assistant and then associate dean at the University of Kansas School of Medicine in Kansas City.

Since 1959, Dr. Wilson served at the University of Missouri at Columbia, successively, as professor of pharmacology, school of medicine, and director of the medical center until he assumed the post of executive director for health affairs.

Dr. Wilson has served in various capacities in numerous health organizations and committees, both private and governmental. Among his many interests is research in renal pharmacology as affected by pressor amines, histamines, and antihistamines. He received a citation from the Missouri Academy of General Practice in 1961.

Dr. Wilson is a member of the American Association of Medical Colleges, American Association of the History of Medicine, American Medical Association, American Academy of General Practice, Sigma Xi, Alpha Kappa Kappa, Phi Mu Phi, Alpha Omega Alpha, and Pi Kappa Epsilon.