

Recent developments in drugs and medicines, changes in the size of manpower engaged in their production and compounding, changes in the nature of products, materials, and dosage forms, cost and price developments, and changes in the dollar volume of prescription pharmaceuticals are reviewed.

Drugs and Medicines

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OVER the past few decades, new drugs and medicines have contributed importantly to progress in public health. "Miracle" drugs have lowered national death rates and sharply reduced acute communicable diseases.

Since the introduction of sulfa drugs in 1937, deaths from influenza-pneumonia have decreased 75 percent, from 114.9 per 100,000 in 1937 to 27.1 per 100,000 in 1955 (1). The principal diseases of childhood—scarlet fever, streptococcal sore throat, diphtheria, whooping cough, measles—which caused 10 deaths per 100,000 children in 1945, in the space of only 10 years dropped to 1 death per 100,000, a decrease of 90 percent (2). According to unpublished data of the National Office of Vital Statistics, the mortality from all infectious diseases dropped in 50 years from 676.2 per 100,000 in 1900 to 44.3 per 100,000 in 1956.

Drugs and medicines have transformed both the practice of medicine and the patients' use of health services. The drug industry responsible for the development, production, and distribution of these products has helped to support medical research in its own laboratories and in the medical schools, universities, and teaching hospitals of the country. The industry is presently participating in the extensive cancer chemotherapy studies of the Na-

tional Institutes of Health, Public Health Service. Drug firms and community pharmacists also have assisted in the health education programs of health departments and voluntary health agencies.

Pharmaceutical Manpower

About 2 million persons are employed in health occupations. About 111,000 of these are registered pharmacists (3). In addition to those directly employed in the provision of health services, nearly 200,000 are engaged in supplying goods and services essential to health occupations (4). According to the 1954 Census of Manufactures, these persons were engaged in affiliated industries such as the production of scientific and professional instruments and supplies (including medical, surgical, dental, and optical); biological, medicinal, chemical, and pharmaceutical preparations; ophthalmic goods; X-ray and therapeutic apparatus. Of these, the largest number—some 92,000—were engaged in the manufacture of drugs and medicines. In addition to skilled operatives, clerical, and other employees, the drug firms reported 380 physicians in their employ as of January 1957 as compared with 155 ten years before and 65 twenty years earlier. The total number of employees with graduate degrees in the medical and allied sciences was 3,000 as of January 1957 compared

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with 990 ten years before and 300 twenty years earlier (5).

The number engaged directly in health occupations or in affiliated industries is approximately double the 1.1 million estimate of 1929, the latest year of high-level employment in the pre-antibiotic era (6).

The number of pharmacists, however, has not grown correspondingly. Wholly comparable figures for the several decades are not available. Rorem and Fischelis reported for 1931 some 115,000 registered full-time pharmacists in the United States, and a total of about 130,000 individuals legally recognized to practice pharmacy either as fully registered pharmacists or as auxiliary assistants (after making a correction for the many duplicate registrations, that is, registrations issued to the same individual by several States) (7a). In 1955 some 158,775 registrations were held by pharmacists in good standing (many of them duplicates), of which 110,992 were held by pharmacists engaged in active practice in the various States (8a). By the end of 1956, the number of such registrations had increased to 162,459 (9a), but the number held by pharmacists engaged in active practice had decreased slightly to 110,688 (9b). It appears that the number of active pharmacists has not changed materially since 1931.

For the Nation as a whole, in 1955 there were 67 practicing pharmacists per 100,000 population, about half the physician-population ratio. About 89 percent of the pharmacists were engaged in retail pharmacies, 4 percent in hospital pharmacies, 6 percent in manufacturing or wholesale establishments or as representatives of the establishments, and 1 percent in teaching or government positions (8b). Today, about 10 percent of new graduates are going into hospital pharmacy work, and more than 5 percent of the total working pharmacist population is currently so employed (10a). Thirty-eight percent of the pharmacists employed in hospitals and 6 percent in the profession as a whole are women (10b).

The Census of Pharmacy reports that there were 52,779 retail pharmacies at the end of 1955 and 1,176 hospital pharmacies dispensing drugs and medicines. In addition 37,515 dealers other than pharmacists were licensed

in the various States to sell packaged drugs (8c). The number of retail pharmacies has declined absolutely since 1929 (from approximately 60,000 to about 53,000 in 1955), and in proportion to population (7b, 8c). In the 40 years prior to 1929, the population per drug store declined somewhat. In 1890 the population per drug store was 1,838 and in 1895 it was 1,745. By 1903 the ratio had increased to 2,030 persons per drug store, where it remained almost constant for more than 25 years. Since 1929 the population-drug store ratio has increased from 2,020 (7c) to 3,126 in 1955 (8c), that is, there are fewer drug stores for more people (with a trend toward larger prescription departments and less general drug store merchandising).

In contrast the drug manufacturing industry has expanded markedly since 1929 in number of employees. Almost four times as many employees were engaged in the manufacture of drugs and medicines in 1954 (11) as were employed in 1929 (7d).

Products and Materials

The drug industry since the advent of sulfa drugs in 1937 has been characterized by rapid change. The rate of change has been so accelerated that progress in the last 30 years may well have exceeded that of several centuries before.

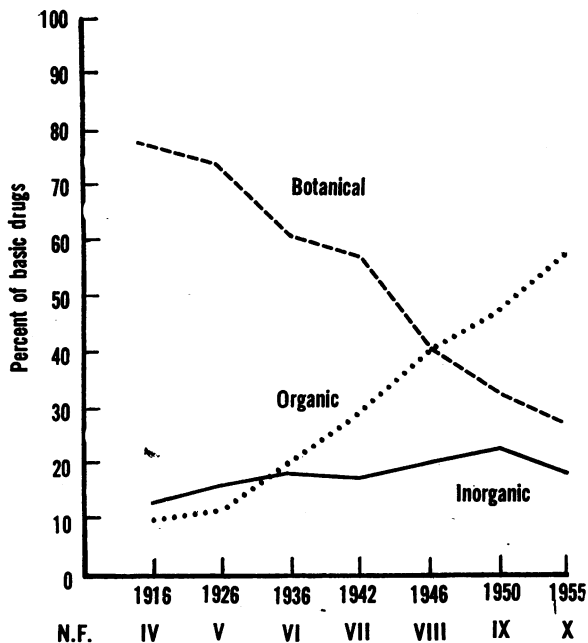
A recent analysis of the basic drugs listed in the National Formulary between 1916 and 1955 reflects the sharp change in the relative importance of basic materials in the drug industry (12a).

In 1916, almost 80 percent of the basic drugs were of botanical origin, 10 percent of organic chemical origin, and 10 percent of inorganic chemical origin. In 1955, the use of botanicals had dropped to 30 percent, organic chemicals had risen to 50 percent, and inorganic chemicals to 20 percent (fig. 1).

Botanical sources have been replaced by organic chemical sources that are more easily available, more concentrated, more easily controlled in their manufacture, and more specifically effective.

Changes in the principal categories of drugs listed in the 1950 and 1955 United States

Figure 1. Trend in National Formulary basic drugs, 1916-55.



SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424-425, July 1955.

Pharmacopeias as shown in table 1 also reflect the tremendous increase in certain types of drugs during a 5-year period. The fifteenth U. S. P., released in August 1955, lists almost 250 new drugs that have been officially accepted for inclusion after stringent review (12a). The new U. S. P., scheduled for publication in 1960, will have an even larger number of new drugs.

Since 1948, more than 3,000 new prescription drug items have entered the market, each with an average life span of 2 to 5 years, and the forecast for new drugs looks even busier (13). In 1940, less than 100 new specialties were introduced (14). In 1957 alone there were 400 new pharmaceutical products put on the market, some of which were entirely new chemical entities; others, new combinations or new dosage forms of less recently new drugs (15, 16a). It has been said that a majority of the prescriptions written today could not have been filled 20 years ago since many of the drugs now used were unknown. Sulfa drugs were introduced in 1937; penicillin in 1940; streptomycin in 1946; antihistamines in 1947; cortisone, ACTH, and hydrocortisone in 1950

and 1951; chlortetracycline U. S. P. (Aureomycin), chloramphenicol U. S. P. (Chloromycetin), and oxytetracycline U. S. P. (Terramycin) in 1950; rauwolfia and certain types of psychopharmacologic agents (for example, meprobamate) in 1953.

In dollar value of total prescriptions filled, antibiotics today account for about 25 percent of total volume (16a). Antibiotics also represent about 25 percent of drug purchases in Public Health Service hospitals (17). (An economic study by the Federal Trade Commission of the entire antibiotic industry, covering prices in particular, but also including patents, manufacturing processes, and other aspects, was recently published, and should throw needed light on this extensively used drug category.)

About 7 cents of every dollar spent for drugs in Public Health Service hospitals in fiscal 1957 was for psychopharmacologic medications (tranquilizers) (17). The proportion is expected to go higher in 1958. Expenditures and use with respect to tranquilizers by the general population parallels Public Health Service experience.

The future of the drug industry is now based on constantly developing new products. A president of one of the leading drug firms has stated "the pharmaceutical industry lives in the shadow of its own obsolescence" (16b).

With the intensified current basic research

Table 1. Changes in principal categories of drugs included in United States Pharmacopeia

| Drug categories | U. S. P. XIV (1950) | U. S. P. XV (1955) | Percent increase |
|-----------------------------------|------------------------|-----------------------|---------------------|
| | Number of categories | | |
| Antihistamines--- | 2 | 13 | 550 |
| Antibiotics----- | 5 | 12 | 140 |
| Diagnostic aids--- | 9 | 16 | 78 |
| Endocrine prepara- tions----- | 18 | 25 | 38 |
| Analgesics and sedatives----- | 18 | 21 | 17 |
| Biologicals----- | 29 | 34 | 17 |
| Chemotherapeu- tic agents----- | 27 | 31 | 15 |
| Vitamins----- | 13 | 15 | 15 |

SOURCE: Reference 12a. Based on Journal of the American Pharmaceutical Association (Practical Pharmacy Edition) 16: 424-425, July 1955.

in mental illness, coronary diseases, cancer, and chronic problems of old age, a poll of leading drug company executives indicates that they expect drugs affecting these types of illnesses to be important in the next 5 or 10 years (16b).

Highlighting the anticipated drug needs of the future are the following (18):

1. Drugs which will permit therapeutic approaches to a variety of mental illnesses and personality problems.
2. New chemical and antibiotic treatments to arrest certain forms of cancer.
3. New treatments for the prevention and cure of hypertension and other circulatory ills.
4. New developments to control degenerative diseases.
5. New discoveries for the better management of nutrition.
6. New products to subjugate a number of the still resistant viral diseases.

Pharmacist and New Products

One consequence of the newer drugs and the growth of the medical materials industry has been a change in the function of the pharmacist. Writing in 1929, Fischelis emphasized that the "development of machine production of pharmaceuticals has left its mark on the retail pharmacies in that it has reduced the function of the apothecary in many cases to that of dispensing prepared medicines" (19). The products developed in the subsequent years have accelerated the trend observed by Dr. Fischelis 30 years ago.

The pharmacist is no longer primarily the compounder of powders, ointments, and potions, but the dispenser of prefabricated medicines on prescription. More than 80 percent of all prescriptions sold at present are dispensed rather than compounded (13).

Another consequence has been a sharp increase in prescription practice of the drug store. Prescription volume increased from an average of less than 10 percent of total drug store sales some 30 years ago (7e, 20) to about 30 percent at the present time (21a, b). The average prescription price has increased during that period almost as rapidly as the volume (table 2). Total drug sales, including prescription accessories and packaged medicines,

Table 2. Ratio of prescription volume to total drug store sales and average prescription prices for selected years, 1929, 1931, 1941, 1946-56

| Year ¹ | Ratio of prescription volume to total sales (percent) | Average prescription price |
|-------------------|---|----------------------------|
| 1929 ----- | 8.5 | \$0.85 |
| 1931 ----- | 8.1 | .92 |
| 1941 ----- | 13.2 | .93 |
| 1946 ----- | 15.8 | 1.33 |
| 1947 ----- | 16.6 | 1.41 |
| 1948 ----- | 18.8 | 1.51 |
| 1949 ----- | 19.0 | 1.60 |
| 1950 ----- | 20.4 | 1.77 |
| 1951 ----- | 21.8 | 1.90 |
| 1952 ----- | 23.7 | 2.08 |
| 1953 ----- | 24.2 | 2.19 |
| 1954 ----- | 24.9 | 2.27 |
| 1955 ----- | 27.3 | 2.46 |
| 1956 ----- | 29.5 | 2.62 |

¹ SOURCE: For 1929, reference 7e; for 1931, reference 20; and for 1941, reference 21a,b.

account for about 50 percent of drug store sales (16c).

Total drug store sales in 1929 amounted to \$1,650 million (7b); in 1956 these sales had risen 358 percent to \$5,912 million (16a). During the same period prescription volume grew from about \$140 million (7e) to \$1,466 million (16a), an increase of more than 1,000 percent, almost three times as fast as total drug store sales. Rorem and Fischelis have observed that the index of drug sales volume does not parallel disease incidence, but tends to reflect the level of expendable consumer income (7f).

A third consequence is the increase in the share of drug sales to hospitals. Of an estimated expenditure of \$190 million in 1929 for prescription drugs, hospitals and dispensaries purchased \$25 million, or less than 13 percent; drug stores bought \$140 million, or 74 percent; and physicians accounted for the remaining \$25 million (7g). A recent survey shows that about 24 percent of prescription drugs now goes to hospitals, 56 percent to drug stores, and 20 percent to physicians (12b).

A fourth consequence has been the rise in importance to doctor, pharmacist, and hospital of the "detailman." As a professional service representative in the pharmaceutical

and chemical industry, he is required to have scientific knowledge and the ability to impart and use it effectively in selling prescription drug products (22). He often is a pharmacist, sometimes a medical student or graduate, always a well-informed individual. His duties are to visit physicians, dentists, veterinarians, wholesale and retail druggists, hospitals, clinics, and dispensaries, exporters, and all other possible purchasers of his company's pharmaceutical preparations. He is the means by which the results of research and development become directly known and used. Although exact figures on the number of such "detailmen" currently in the labor force is not available, the number of registered pharmacists alone representing manufacturers and wholesalers of drugs increased from 2,415 in 1955 to 2,739 in 1956 (8*b*, 9*c*).

Dosage and Dosage Forms

The Bureau of Labor Statistics has for many years included in its medical care component of the Consumers Price Index a breakdown of drug items used in selected prescriptions with the content and dosage form carefully specified. A typical prescription unit for pricing is specified as a "capsule" prepared by a compounding pharmacist.

The pharmacist-compounded capsule era, together with the era of powders and potions in medication is ending, however. By 1955, tablets produced by a pharmaceutical house in wholesale quantities represented the typical dosage form; parenterals and liquids held second place. Together they accounted for about 75 percent of the new drug dosage (12*a*).

Analysis of the 20 largest volume prescription items currently being dispensed in a Public Health Service outpatient pharmacy shows that 13 of the 20, or 65 percent, are dispensed in tablet form.

Aspirin, which leads all other drugs in volume of output—16½ million pounds in 1956, an increase of 159 percent in the last 16 years—is one of the tablets that has become standardized in content, shape, and size.

Not only has the tablet become the typical dosage form, but the efficacy per tablet is constantly being increased. A penicillin tablet

with a built-in delayed action mechanism has been developed which would require only one tablet per day for 24-hour medication. Other tablets (and some capsules and granules) have been developed and marketed recently which contain in one medication several different drugs in various doses that are released into the system at various times.

The traditional injection of insulin may someday be replaced by a tablet, and has already been in certain cases. A sulfa drug, tolbutamide (Orinase), has been used in about 250,000 cases of diabetes, most of them mild, and on patients over 20 years old. Its efficacy depends on prodding the pancreas into doing its own work. Oral medications are less traumatic than hypodermic injections, are considerably less dangerous and troublesome, and require no sterilization (23).

The controllable techniques involved in the production and distribution of tablets, the standardization of size, shape, and color, the stability of the product, the general public acceptance of tablets as a form of medication, and the ease with which dosages can be taken, all contribute to the increasing manufacture and use of tablets as dosage forms.

Cost and Price Trends

Medications have become more complex, more effective, and more expensive. Writing about 1929, Rorem and Fischelis stated: "The amounts spent by individuals or families for drugs and medicines during a given period do not show a wide variation, and seldom, if ever, amount to totals which are catastrophic in their effects" (7*h*). Individual prescriptions, however, are now far more costly and families may incur sizable drug expenses especially in cases of prolonged or chronic illness. Children for whom maintenance dosages of antihistamines and other drugs are prescribed, for example, may have long-term drug bills of \$15 or more a month, without any allowance for cost of additional dosages required during acute stages of illness. Older people with cardiac, hypertensive, or arthritic conditions may have maintenance medications prescribed for them which total \$25 or more a month. In the 1952-53 study of family medical expense it

was found that 2 percent of the families incurred charges for medicines in excess of \$195 per year (24).

Average family or per capita expenditures for drugs, however, have increased somewhat less than disposable income, that is, family income after taxes. In 1956, \$1,885 million was spent by the Nation's families for drugs, medical supplies, and sundries, exclusive of drugs and dressings used in hospitals or dispensed by physicians. This represents an annual outlay of 0.66 percent of disposable income, or \$35.70 per family and \$11.41 per person. In 1929 personal spending for drugs, medical supplies, and sundries amounted to \$604 million, or 0.73 percent, of disposable income, an expenditure of \$16.73 per family and \$4.96 per person (table 3). During that time disposable personal income increased from \$83.1 billion to \$287.2 billion, an increase of 346 percent; personal spending for drugs, medical supplies, and sundries increased only 312 percent (25a, b, c).

Personal expenditures for drugs, medical supplies, and sundries have increased since 1929 less than medical care generally and less than many items within the medical care component. In part this may reflect higher real incomes of the Nation's families, improved health education, increased use of physician services, and the relative growth of prescribed as compared with nonprescribed drugs. In

part this may reflect the expanded use of hospital care and the relative increase in costs of various services included in hospital care. As a consequence (fig. 2), drugs, medical supplies, and sundries as a personal expenditure represented a smaller part of the personal medical care dollar in 1956 than even 10 years earlier in 1946, or than in 1939 and 1929 (25a, b, c).

Drug costs as a part of hospital costs, however, have risen significantly more than other components of the hospital dollar. The Commission on Financing Hospital Care found that drugs as a percent of hospital costs between 1942 and 1952 had increased more than 300 percent (table 4), a greater increase than any other of the services analyzed (26).

Personal or hospital drug expenditures reflect changes in volume of use of medications, types of drugs used, and price per unit.

There are also data which show only the changes in price per unit, without reflecting volume of prescriptions. Two basic types of price series are available as measures of retail price changes.

The first type is the often-quoted price series compiled by the Bureau of Labor Statistics. According to the Bureau of Labor Statistics Consumer Price Index, a measure of change in the price of specified items customarily purchased by urban wage-earner and clerical-worker families (27), the price index of all items rose 96 percent between 1936 and 1956

Table 3. Disposable personal income, personal spending for medical care, and for drugs and sundries (per capita and per family) for selected years, 1929, 1931, 1939, 1941, 1946, 1951-56

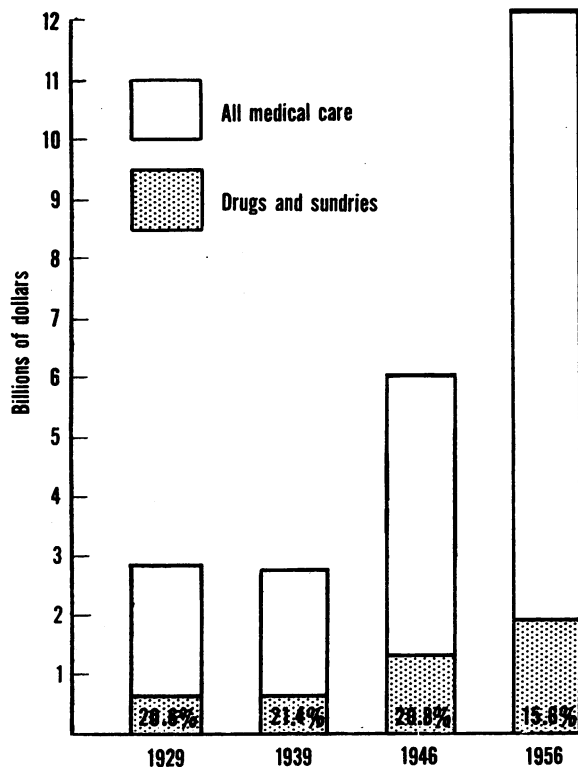
| Year | Disposable personal income (millions) ¹ | Personal medical care expenditures (millions) | Personal expenditures for drugs and sundries | | | | |
|------|--|---|--|------------------------------------|----------------------|------------|------------|
| | | | Total (millions) | Percent disposable personal income | Percent medical care | Per capita | Per family |
| 1929 | \$83, 120 | ² \$2, 937 | ² \$604 | 0. 73 | 20. 6 | \$4. 96 | \$16. 73 |
| 1931 | 63, 840 | ² 2, 549 | ² 517 | . 81 | 20. 3 | 4. 17 | 14. 05 |
| 1939 | 70, 444 | ² 2, 848 | ² 612 | . 87 | 21. 5 | 4. 94 | 14. 96 |
| 1941 | 92, 982 | ² 3, 298 | ² 725 | . 78 | 22. 0 | 5. 51 | 17. 52 |
| 1946 | 159, 182 | ² 6, 104 | ² 1, 271 | . 80 | 20. 8 | 9. 18 | 29. 33 |
| 1951 | 226, 069 | ² 8, 780 | ² 1, 516 | . 67 | 17. 3 | 10. 03 | 30. 64 |
| 1952 | 237, 374 | ³ 9, 397 | ³ 1, 569 | . 66 | 16. 7 | 10. 23 | 31. 25 |
| 1953 | 250, 235 | ³ 10, 107 | ³ 1, 615 | . 65 | 16. 0 | 10. 35 | 31. 97 |
| 1954 | 254, 463 | ³ 10, 603 | ³ 1, 631 | . 64 | 15. 4 | 10. 25 | 31. 89 |
| 1955 | 270, 189 | ³ 11, 273 | ³ 1, 747 | . 65 | 15. 5 | 10. 76 | 33. 49 |
| 1956 | 287, 202 | ³ 12, 106 | ³ 1, 885 | . 66 | 15. 6 | 11. 41 | 35. 70 |

SOURCES: ¹ Reference 25a.

² Reference 25b.

³ Reference 25c.

Figure 2. Personal expenditures for drugs and sundries and all medical care for selected years, 1929, 1939, 1946, 1956.



(from 59.3 to 116.2); the medical care index (all items) rose 85 percent (from 71.6 to 132.6); and prescriptions, drugs, and medical supplies rose only 37 percent (from 82.8 to 113.7). Prescriptions, drugs, and supplies make up about 17 percent of all medical care, and medical care about 5.4 percent of all items in the Consumer Price Index.

During the first decade, from 1936 to 1946, the medical care index rose relatively slowly, only one-third above 1936. The rest of its increase, two-thirds, occurred in the second decade, from 1946 to 1956. In the overall 20-year rise, medical care ranked fourth after food, personal care, and apparel.

In the 10-year period from 1946 to 1956, the total medical care index increased to 132.6 as compared with 116.2 for all items (1947-49=100). Within the medical care category are included doctors', surgeons', and dentists' fees, optometric examinations and eyeglasses, hospital room rates, group hospitalization, prescriptions and drugs. Hospital room rates

showed the largest increase, rising to 173.3. Prescriptions and drugs, combined, increased to 113.7. Prescriptions, alone, increased to 121.0, largely as a result of the new drugs. Figure 3 shows the relative increases in total medical care index in the last 10 years, and in prescriptions and drugs particularly. The index of aspirin prices was 125 in 1929 (1947-49=100), fell steadily to 97.6 in 1941, rose to about 100 in 1948, and has remained at more or less the same level since.

The second type of price series represents average prescription prices. Whereas the Bureau of Labor Statistics drug price series measures changes in price for a specified "basket of drug items" selected as of a given period, the average prescription price series reflects changes in the drug item purchased.

The average prescription prices increased from about \$0.85 in 1929 to \$2.62 in 1956, a more than threefold increase (table 2). Average prescription prices in 1956 varied from \$2.49 to \$2.79, according to different surveys. A recent figure for 1957 gives \$2.93 as the average prescription price, the highest on record (16a).

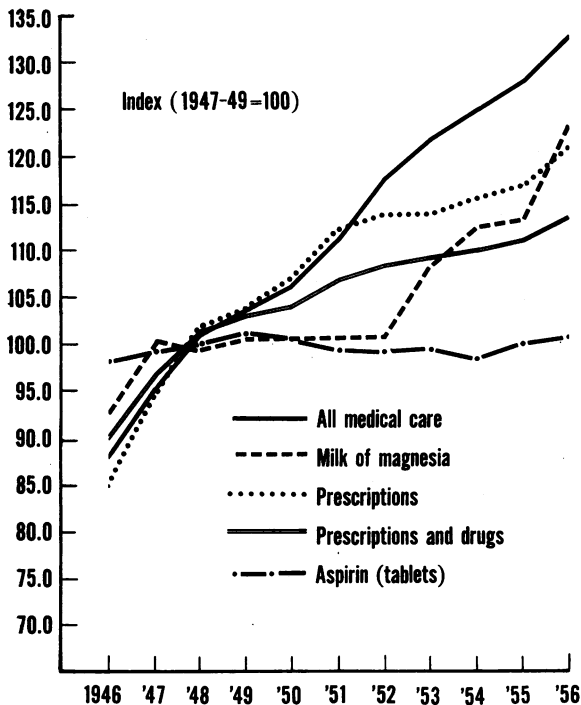
The average price per unit of many of the newer drug types is more than \$3 per prescription. For about 8 of the 26 drug classifications used by the *American Druggist* in its annual prescription survey—classifications accounting for about 54 percent of prescriptions sales in 1956—the average price per prescription was over \$3. In 1957, the figures are even

Table 4. Average amount billed to semiprivate nonmaternity patients utilizing specified hospital services, 1942 and 1952

| Service | Average amount billed | | Percent increase 1942-52 |
|--------------------------|-----------------------|----------|--------------------------|
| | 1942 | 1952 | |
| Operating room..... | \$10. 14 | \$23. 81 | 135 |
| Anesthesia..... | 6. 97 | 15. 79 | 127 |
| Electrocardiogram..... | 8. 56 | 14. 08 | 64 |
| Basal metabolism..... | 6. 76 | 9. 87 | 46 |
| Drugs and dressings..... | 7. 66 | 31. 63 | 313 |
| X-ray..... | 15. 97 | 20. 66 | 29 |
| Laboratory..... | 5. 97 | 18. 02 | 202 |
| Physical therapy..... | 12. 98 | 24. 20 | 86 |
| Oxygen therapy..... | 13. 52 | 38. 59 | 185 |

SOURCE: Reference 26.

Figure 3. Consumer price indexes for medical care items, annual averages.



more revealing. Table 5 shows that 8 of the 26 classifications accounted for 60 percent of the dollar value of prescriptions; all averaged more than \$3 per prescription, and two more than \$4 (16a, d).

Prices of new drugs follow a characteristic pattern of decline after initial introduction, and when volume use and production take place. Penicillin in 1943 sold for \$20 per 100,000 units in injectable form. In 1956, it sold for \$0.20 per 100,000 units in tablet form, a drop of 99 percent (28a, 29a). Since its introduction in 1950, cortisone has dropped 90 percent in price (15). Within 2 years of its introduction cortisone fell from \$200 per gram when made from animal bile to \$50 when made from yams and other plants (28a). Streptomycin dropped 40 percent in less than a year (13). Insulin now costs about 6 percent of what it did 30 years ago, shortly after it was introduced (28b).

The downward movement in prices of new drugs is a brake on the prescription price index. However, this type of price index is also influenced by the distribution of prescriptions among different kinds of drugs, as well as by

the rapid obsolescence of drug items and their continuous replacement by newer, more effective, and, at original issue, more expensive drugs.

Drug and Illness Costs

The cost of medicines may also be viewed as a part of the cost of illness. As indicated earlier the percent of the personal medical dollar going to drugs, medical supplies, and sundries has declined. In terms of specific illnesses drug costs have risen sharply but have been instrumental in reducing the total medical outlays and in shortening hospital stays and time loss from productive activity.

According to one source, 20 years ago a case of lobar pneumonia meant 5 weeks in a hospital, long convalescence, and \$300 to \$400 for doctors, nurses, medicine, oxygen, and hospital care. Today it means 2 weeks of illness, generally at home, back to work immediately thereafter, and \$15 to \$30 for drugs (29b).

Thirty years ago the treatment of mastoiditis cost at least \$1,000, required surgery, and involved the possibility of permanent impair-

Table 5. Comparison of selected prescription types by percent of total dollar value of all prescriptions sold, and average price, for 1956 and 1957

| Prescription type | Percent of total dollar value | | Average price | |
|---------------------------|-------------------------------|-------|---------------|--------|
| | 1956 | 1957 | 1956 | 1957 |
| Anti-infectives----- | 24.1 | 25.4 | \$3.68 | \$4.03 |
| Sedatives----- | 14.5 | 15.2 | 2.86 | 3.01 |
| Cardiovasculars----- | 9.3 | 6.8 | 3.20 | 2.91 |
| Anti-arthritis----- | 6.0 | 5.4 | 4.16 | 4.10 |
| Stimulants----- | 3.9 | 4.1 | 3.05 | 3.23 |
| Hematinics----- | 4.0 | 3.5 | 3.62 | 3.52 |
| Sex hormones----- | 2.4 | 2.1 | 3.15 | 3.26 |
| Therapeutic vitamins----- | 2.3 | 2.5 | 3.46 | 3.31 |
| Preventive vitamins----- | 1.9 | 1.7 | 3.14 | 3.19 |
| Other types----- | 46.1 | 40.1 | ----- | ----- |
| Total----- | 100.0 | 100.0 | ----- | ----- |

SOURCE: References 16a, d.

NOTE: The italicized figures are not included in the totals, for the year involved. Thus the number of specific prescription types listed is 8 in both 1956 and 1957. Sedatives were less than \$3 in 1956, hence not included for that year; cardiovasculars were less than \$3 in 1957, hence not included for that year.

ment of hearing. Today \$15 worth of antibiotics clears up most cases without surgery (29c). Syphilis was an important cause of expensive and protracted illness two decades ago. Today, syphilis is often "cured" or at least brought under control with one shot of long-acting penicillin (14). In the United States, penicillin has completely supplanted older forms of therapy such as arsenic and bismuth (30). New drugs, including isoniazid, have helped to reduce deaths from tuberculosis. Between 1946 and 1955 the tuberculosis death rate dropped from 34.9 per 100,000 to 9.1 per 100,000, a decrease of almost 75 percent (2). Many patients are now cured at home in a small fraction of the time, and the cost, it took when prolonged rest in a sanatorium was the major technique.

Volume of Prescription Pharmaceuticals

A recent guide to the sales and status of the drug market warns the reader, "Before using this book, we suggest that you rid yourself of all old conceptions of the magnitude of the volume of manufacturers' sales of ethically promoted pharmaceuticals for human use. Otherwise today's figures will seem fantastic. Times have changed. We sometimes look back with nostalgia to 1929 when the manufacturers' sales amounted to about \$250 million. Think now of sales in manufacturers' dollars of nearly \$6 for each and every one of 165 million persons in the United States!" (12c).

From 1929 to 1955, then, the sales volume of manufactured prescription pharmaceuticals almost quadrupled, from \$250 million to \$990 million. Current trends show sales to be considerably higher.

In a recent speech before the 61st Annual Conference of Food and Drug Officials of the United States, an official of one of the major drug laboratories said that 10 leading drug houses alone, in their 1956 annual reports, showed sales that ranged from \$100 million to \$200 million (31).

One drug company reports sales in 1957 of \$207 million as compared with its 1956 sales of \$178 million (32). Its 1958 sales for the first quarter were \$54 million as compared with \$51 million in 1957; its 1958 earnings for the same

period were \$61½ million, 19 percent above 1957 and a record high (33).

The manufacture of prescription pharmaceuticals is now well over a \$2 billion industry. The increased volume of wholesale drug sales is of course reflected in the increased retail prescription volume.

An industry publication, in its Silver Anniversary issue, stated: "Drug store sales volume in 1956 was the highest ever recorded" (21c). In an 11-year period the number of prescription sales increased by 50 percent and the income from prescriptions tripled, largely because of increase in average prescription prices, but to some extent from an increase in the number of prescriptions dispensed (21d). "The 11-year rise in average prescription prices is due to the tremendous increase in the widespread use of new therapeutic agents, virtually all of which are costly to dispense." (21b).

Summary

The nature of the drug industry has changed in the last 30 years. With it has changed the manpower in the industry and the pharmacist's role—from a compounder to a dispenser of drugs. The increased number of drugs and their complexities have intensified his services as drug therapy consultant to physicians and dentists. The basic sources and compounding of pharmaceuticals have changed in character, and have increasingly become the object of intensive research by both private and public organizations in the effort to develop specific drugs for specific illnesses. The dosage and dosage forms have become more concentrated and standardized, generally in tablet form. Drugs represent a decreasing proportion of the medical care dollar and of disposable income. The price of drugs generally has been high for new items, falling with volume use and production, or obsolescence. Average price per prescription has doubled since 1946 and more than tripled since 1929. The length of some illnesses has been shortened by the development of specific therapies, and the cost has been cut even though drugs are more expensive. The volume of manufactured prescription pharmaceuticals increased from \$250 million in 1929 to more than \$2 billion in 1956, a tenfold increase in

less than 30 years. The volume of retail prescriptions has increased during that period, from \$140 million to \$1,466 million.

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Interstate Shipment of Milk

Ban on out-of-state milk, unless produced and handled under conditions no less adequate in protection of public health than milk produced in State upheld. *James v. Todd*, 103 So. 2d 19 (Alabama, Aug. 22, 1957).

A declaratory judgment of the Supreme Court of Alabama has upheld the validity of an Alabama statute (Act No. 570, 1955 Acts) prohibiting the shipment of milk into Alabama from another State "unless such milk is produced and handled under sanitary conditions no less adequate in protection of public health than milk produced in the State of Alabama," and authorizing the State Commissioner of Agriculture and Industries to inspect the conditions under which out-of-state milk was produced and to issue and revoke permits for transportation of such milk into Alabama.

After citing *Milk Control Board of Pennsylvania v. Eisenberg Farm Products*, 306 U. S. 346, 59 S. Ct. 528 as evidencing recognition by the Supreme Court of the United States that the milk business is essentially local and, therefore, subject to the police power of the State, the Alabama court stated:

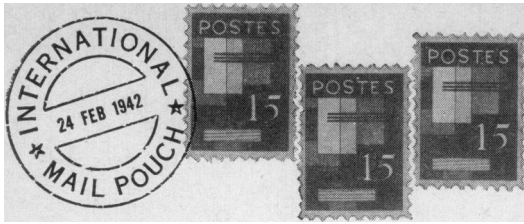
"Under its police power, the State of Alabama is authorized to enact laws designed to protect the health of its citizens and more particularly where milk is concerned because of its nutritional importance to human beings and because of its susceptibility to contamination. . . . The Legislature may even grant to a municipality the power to provide health regulations."

The mere fact that the statute was applicable only to out-of-state milk did not, the court held, constitute an unreasonable discrimina-

tion or a burden on interstate commerce. The validity of the statute was, however, held to depend on whether it was a reasonable system established as a safeguard of the public health or a system calculated to prevent the importation of out-of-state milk in competition with local supplies. The court distinguished *Dean Milk Co. v. City of Madison*, 340 U. S. 349 (where the appellant was denied a license to sell milk in the city because its plant was more than 5 miles away), and other related cases, on the ground that those cases dealt with the administration or enforcement of statutes which in operation "made it practically impossible to import . . . goods into the State."

While the court conceded that in the administration of the Alabama Act there was a possibility of abuses such as would raise a question of its constitutionality, it concluded that the statute, on its face, was reasonably related to the protection of the public health and was not intended to prevent the importation of out-of-state milk in order to eliminate competition with local supplies.

The court warned, however, that enforcement of the statute under a construction (supportable under the literal language of the act) which would limit permits to shippers of milk, and hence exclude milk from out-of-state producers who were not also shippers, would be unconstitutional.



Public Health Dentistry

The School of Hygiene and Public Health at the University of São Paulo is now training dentists to administer dental public health programs in Latin America. The course of study, leading to a degree equivalent to master of public health, is the first such course in Brazil.

Sixteen dentists, half of them studying under World Health Organization fellowships, enrolled in the course in February 1958. They come from Argentina, Brazil, Colombia, Costa Rica, El Salvador, Paraguay, Peru, and the Dominican Republic.

They study general public health subjects with physicians, veterinarians, and engineers. Separate classes on specific dental subjects include refresher courses in dental techniques, current information and methods in caries prevention, and technical guidance during field work.

Several agencies are cooperating with the university in this course. WHO provides advisory services, fellowships, and teaching materials; the Kellogg Foundation gives financial aid, equipment, and supplies; and Serviço Especial de Saúde Pública participates in the students' field training.

—ALFREDO REIS VIEGAS, D.D.S., M.P.H., *assistant professor, School of Hygiene and Public Health, University of São Paulo, Brazil.*

Typhus Among the Araucanians

In Cautín Province, Chile, where the National Health Service has battled classic louseborne typhus fever for several years, are some 150,000 Araucanian Indians, the people celebrated in Ercilla's epic poem, "La Araucana."

The Araucanians live primitively in *ruças*, or huts, much as they did when they successfully withstood for hundreds of years both Inca and Spanish conquest. Their huts are scattered singly and in three's and four's over a wide area, and they travel long

distances on foot, horseback, or by oxcart. But their custom of attending funerals in extraordinarily large numbers has helped to spread typhus, which they carry back to their home areas after these gatherings.

We visited the central Chilean province, which has an endemic focus of typhus, to get first-hand information after the National Health Service asked for help in eradicating the disease. The area where most work is needed is impassable to motor vehicles 9 months of the year, and only jeeps can be used the other 3 months. Nevertheless, we hope to start a combined disinfestation and typhus vaccination campaign the latter part of 1958.

—G. HOWARD GOWEN, M.D., *chief, Health and Sanitation Division, U. S. Operations Mission, Chile.*

The Mountain People

The way of life of the mountain people in the Philippines makes it difficult for malaria eradication teams to protect them from the disease. Dissident and evasive with lowlanders, the mountaineers are hard to reach. Distribution of a drug-salt mixture is planned.

The mountain people withdraw from the settlements and follow their own customs in remote, high, forested areas. Some grow mountain rice and sweet potatoes on cleared plots which they abandon after a year or two. Others simply gather the food nature provides. Houses may be nonexistent, or tree dwellings, or roofed platforms, or permanent structures.

Practically all such groups have been found to be malarial to some degree and thus are reservoirs of infection. Intermittently, the mountain people come to the settlements to trade for salt or other articles or to work as itinerant farm laborers. This influx of chronically infected people causes continual transmission.

Malaria among the mountaineers has helped to disprove the assumption that malaria cannot be transmitted at heights above 2,000 feet, because of the habits of the principal vector, *Anopheles minimus flavirostris*. Several other anophelines, whose habitats extend to 3,300 or even 5,500 feet, have been incriminated by anopheline dissection.

—JOHN W. MCDOWELL, *malaria control adviser, U. S. Operations Mission, Republic of the Philippines.*