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ASSESSMENT OF THE PHARMACEUTICAL INDUSTRY 1978-2000

A report for the Global Preparatory Meeting on Pharmaceuticals

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prepared by the

Sectoral Studies Section
International Centre for Industrial Studies

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1. INTRODUCTION

1.1 Objectives and scope of the study

The Lima Declaration and Plan of Action on Industrial Development and Co-operation was adopted at the Second General Conference of UNIDO in March 1975, and was endorsed by the General Assembly at its seventh special session. In the Lima Declaration the role of industry was reasserted as a dynamic instrument of growth to attain a rapid socio-economic development of developing countries. It called for an increase in the share of the developing countries to at least 25 per cent of the total industrial world production by the year 2000. It declared that developing countries should pay special attention to priority sectors. One of the selected priority sectors was the pharmaceutical industry.

Furthermore, among the basic needs of the world population, health improvement is one of the most pressing concerns. Its magnitude is compounded by the faster growth of the population in developing countries, which by the year 2000 would account for about 75 per cent of the total world population.

Meeting this challenge requires extensive infrastructures for health care and for pharmaceuticals' supply.

However, meeting the Lima goal in concrete terms faces two main difficulties. First, global studies carried out in 9 industrial sectors show that if past trends continue, it is unlikely that developing countries will attain the 25 per cent share of the world production. Its attainment requires a firm commitment to international co-operation specially in the modern and dynamic sectors such as pharmaceuticals. Second, meeting the 25 per cent goal requires a large implementation programme for setting up new plants in developing countries. This programme is often thought out in terms of establishing individual projects in several developing countries rather than in organizing the process of developing the pharmaceutical industry in these countries. The first is much easier to carry out although its piecemeal approach does not assure the attainment of the Lima goal, whereas the latter, more difficult and complex, may not only attain the Lima goal but may become instrumental in bringing about qualitative and quantitative socio-economic changes towards a more equitative and beneficial world situation, which is much the most important.

Consequently, for a successful overcoming of both difficulties it is required a long term political aim agreed by the parties concerned Without it,

it becomes rationally impossible to design an appropriate economic strategy, to spur the necessary negotiations within international co-operation schemes and to assess the amount, the composition and the timing of the inputs required to attain the desired aim.

Experience has shown that when the political aim is missing or when both the political and the economic objectives are the same, then usually frustration in the negotiations, discouragement or hardening of positions into dead lock situations occur.

Experience has also shown that when governments and enterprises have a political blue print for the future fully understood at least by their leaders and managers, they have an unassailable position. Examples of these can be seen in the cases of Brazil, the Republic of Korea, Singapore and Bulgaria.

The process of policy-making and decision-making required to bring about results entails a rather complex set of motivations and factors, some of which, albeit important ones, are analytic. Within those, countries are usually familiar with their national situation, although not to the same degree of accuracy in all industrial sectors, and become progressively less familiar at regional and world levels.

Moreover, since they often do not have the means for an independent checking of the data obtained at regional and global levels from published sources and contractors, they tend to take them at face value and may make national plans on that foundation. This situation is quite applicable to the pharmaceutical sector, where the serious data problems are presented in the following heading, statistics.

In order to help in implementing the Lima goal, UNIDO set up the system of consultations for specific industrial sectors. For this industry the process of consultations has included expert group meetings and is about to hold a Global Preparatory Meeting in order to select the issues for discussion at the First Consultation Meeting on the Pharmaceutical Industry scheduled for December 1980.

This report has been prepared for the Global Preparatory Meeting, in order to present regional and global data and analysis to the experts attending this meeting, so that they may appraise the regional and world situations from their own points of view and choose the relevant issues accordingly.

The report gives an appraisal of the current situation on consumption, production and trade, a forecast to the year 2000 based on two hypothesis:

past trends and the Lima goal, and presents the main problems of this
industry including the perceived positions of the main actors.

1.2 Statistics

For the past two and a half years UNIDO has been endeavouring to
gather statistical data on this industry at country and product levels.

Several approaches were successively tried, ranging from consulting
firms, individual consultants, country contacts, published sources to ·
contacting the pharmaceutical manufacturers associations (PMA). The
fractionation and contradictions found in the data are among the worst encountered
in the nine i 'ustrial sectors studied.

There is no authoritative world statistics on pharmaceuticals, and what
exists comes from three main sources: IMS that surveys sales at pharmacy
level for .he main consuming countries but centrally planned ones, the
PMA's based on reports from member companies, and government sources such as
ministries, food and drug administrations. Additional sources became
available through pharmacy associations, central buying agencies, consulting
firms and broker's analysts.

In a last attempt to clear up the situation, UNIDO got a favourable
response from several PMAs through their International Federation of
Pharmaceutical manufacturers Associations (IFPMA). Their corrected figures
of domestic sales plus the checkings and corrections on the basic country
data previously prepared by UNIDO, were very useful for arriving at the
regional and world tables given in the annex.

There are four main statistical problems that bear upon the gathering
and interpretation of the data presented in the annexes:

(a) The unavailability of authoritative data that was partly discussed
above, has been partially solved at pharmaceutical total levels through
IFPMA for many of the major consuming countries. However, further breakdowns
into detailed therapeutic categories and main individual products in volume
and value were not achieved. Consequently, only typical estimates are given
for the main therapeutic categories. The market analysis at product level
is carried out, as far as UNIDO knows, only by IMS on a regular basis. However,
that information is unavailable for UN Organizations due to an agreement

between IMS and the large corporations that effectively creates an exclusive "pharmaceuticals data club" that has a fee of US 500,000 per year. Nevertheless, public information produced by IMS and SCRIP, the only two specialised publications or global pharmaceutical data, were extensively used.

(b) The problem of nomenclature became quite a hurdle for different sources present data grouped in different ways, often incomparable between them. Moreover, there is a major difference between the definitions of ethical (prescription-only medicines) and non-prescription pharmaceuticals and their practical application. Customarily ethical pharmaceuticals are grouped by PMA's without listing the type of pharmaceuticals included, and by some governments according to their own classifications. However, in practice the number of pharmaceuticals sold by prescription is highly variable from country to country and from year to year, the extreme being several developing countries where the only pharmaceuticals requiring prescription are narcotic and psychotropic products.

Furthermore, the main definitions also vary including ethicals under prescription-only, ethical over-the-counter (OTC), OTC, proprietary, limited OTC, non-biological, etc. Additional data is given under different names such as drugs, dosages, pharmaceuticals, medicinals, preparations, remedies, etc, at different price levels such as ex-manufacturers, wholesalers, retailers with some prices at the buying end and some at the sales end for each level of the distribution channel.

Therefore, in order to introduce coherence in the naming of the various elements pertaining to the production and consumption of pharmaceuticals, it was prepared a schema of pharmaceutical flows given in figure 1 and shown under the methodology heading.

(c) The problem of trade data was particularly difficult for two reasons: first, export statistics include everything down to dentist products and medical equipment in many countries or include only some elements such as preparations, dosage forms and bulk drugs, raw materials, etc., often without showing an export breakdown by main categories. Second, import statistics show the same mixture of product categories without separating at least pharmaceuticals from non-pharmaceuticals, and within the first category between dosage forms and the rest of pharmaceuticals, be it formulations, bulk drugs and intermediates, for they also appear later on under the domestic production heading, thus making a double counting.

Consequently, based on the trade breakdown obtained for several countries, factors were estimated in order to adjust the trade statistics available for the remaining countries. Details of it will be given under the methodology heading.

(d) The problem of foreign exchange variations became quite distorting from 1976 onwards for most regions because the value of pharmaceuticals had to be given in US dollars to ensure an uniform base for international comparability. Consequently, countries with stronger currencies than the dollar show growth rates higher than those achieved in their local currencies. Conversely, countries with weaker currencies than the dollar, compounded by higher domestic inflation rates and devaluations, show an abnormally low growth rate in comparison with that achieved in their local currencies. This factor is specially notorious in Latin America. Regretably, this situation could not be circumvented for UNIDO does not have enough country coverage on pharmaceuticals by amount as it has by value.

The listing of these main problems emphasizes the need of creating a. UNIDO Working Group on Pharmaceuticals, similar to the existing UNIDO/FAO/ World Bank Working Group on Fertilizers and to the about to start UNIDO Working Group on Petrochemicals. Their main tasks will be to prepare an authoritative pharmaceutical data base at country level broken down by therapeutic categories and main pharmaceutical products, and to prepare medium-term forecasts that will serve as foundation for market transparency analysis.

1.3 Methodology

The methodology applied covers three main areas: the structure of this industry, the current data on consumption, trade and production by regions, and the forecasting up to the year 2000.

(a) The structure of the pharmaceutical industry is presented in a simplified form in Figure 1, showing the main pharmaceutical flows. It identifies the main elements and flows of both supply and consumption of pharmaceuticals. The export component left out from the scheme to avoid unnecessary graphical complications, is the reverse of the import flows.

The different stages of the supply side represent the nomenclature that will be used throughout this report, thus enabling the reader to know exactly the matter at hand.

Figure 1 - <u>Scheme of pharmaceutical flows</u>
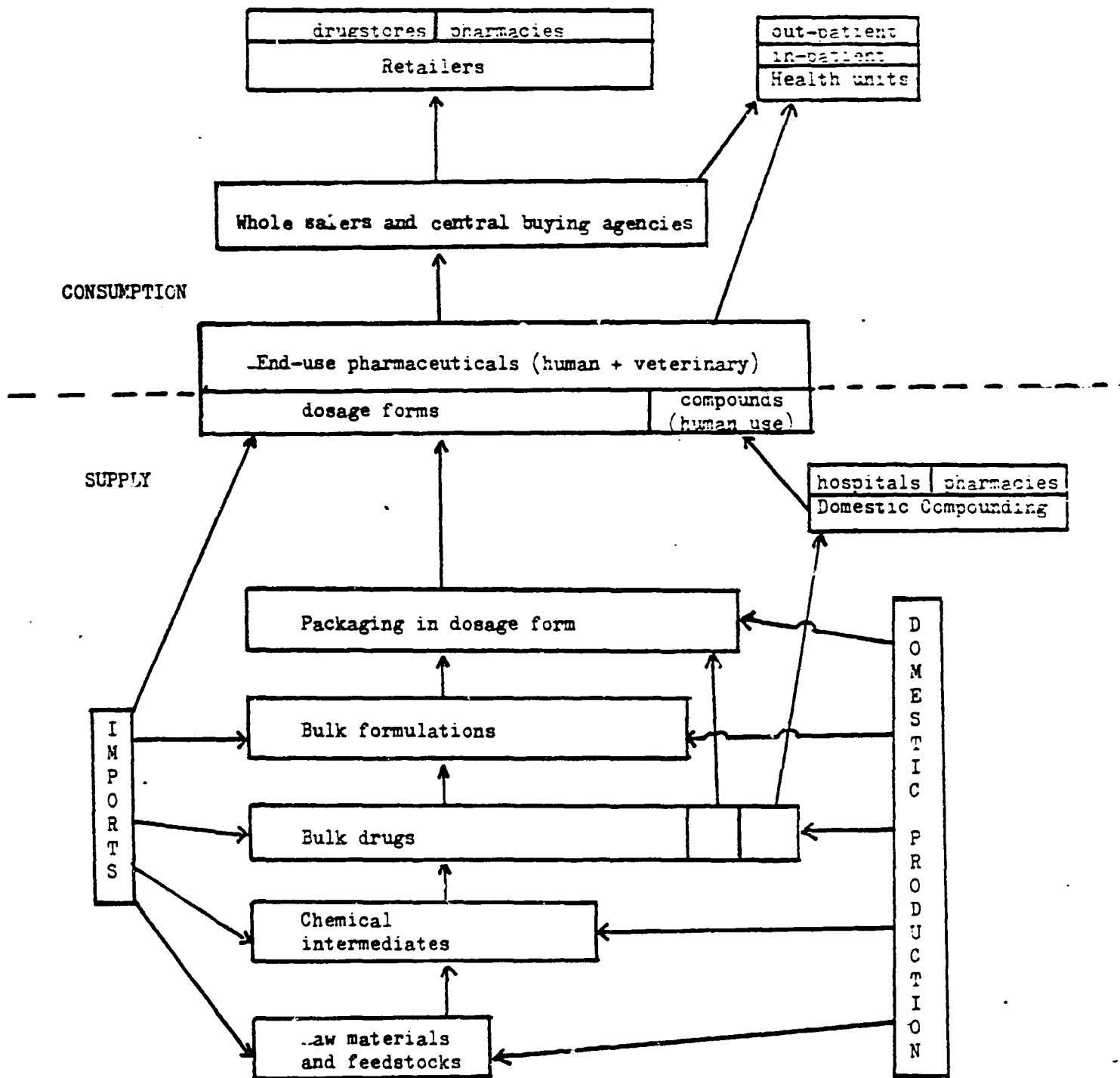
(b) The current data on consumption, trade and production was obtained as follows:

-   From the import data, the dosage form component was identified for the group of countries showing this item in their impoxt breakdown. Then coefficients were calculated in relation to total imports and to their domestic sales. Then the remaining countries that did not show their import breakdown were grouped according to GDP/capita and region and correlated with the GDP/ capita and import data aggregates of the first group of countries. Later on their corresponding dosage form imports were estimated, based on the coefficients of the first group of countries either in relation to total imports or/and to domestic sales, according to the more reliable data available.

-   Domestic consumption was calculated by adding the imports in dosage form to the respective domestic sales given by IFPMA and other PMA's not included in the former's data sheet. In countries without data on domestic sales, their consumption was estimated in two ways. The first, when the data on wholesaler or pharmacy sales was available, it was estimated the proportion represented by non-pharmacy sales (hospitals, clinics, institutions), using the following coefficients: for market economy countries pharmacy/retailers sales represent about 80 per cent of the total consumption. (Real figures show variations between 76 per cent and 83 per cent) For centrally planned economies pharmacy/retailers sales represent between 35 per cent to 45 per cent of the total consumption. The second, that applied mainly to several black African countries where data on pharmaceuticals was unavailable, was estimated based on pharmaceutical consumption/ capita and GDP/capita correlations with similarly developed black African countries for which enough data was available.

-   The exports data was taken as given in the UN publications, taking into account the amendments made by IFPMA and trimming out the non-pharmaceutical component when the country's export breakdown was known. Consequently, export data includes both dosage forms and bulk drugs/intermediates.

-   Domestic production was estimated in two ways. First, by adding domestic sales to exports for countries that have full data. Second, by substracting the import dosage forms from domestic consumption to obtain domestic sales, and then adding to it the exports for the remaining countries.

The pharmaceutical data base thus generated covers the period 1960 to 1978 and it is, to UNIDO's knowledge, the first time that a comprehensive data becomes available at regional and world levels.

The statistical discrepancy between production and consumption is mainly due to the bulk drugs/intermediate component of the exported production (that is the chief responsible for the double counting weeded out from the consumption figures).

The statistical discrepancy between exports and imports reflects the different timing of their respective official recordings at Customs offices, products in transit, temporary stockaging, losses, etc.

Concerning domestic production, production of free samples is not included for it has no selling value although it appears in the respective production cost. It is estimated that "free samples" represent up to 10 per cent of total sales.

(c) The approach used to forecast pharmaceuticals consumption up to the year 2000 is based on the cross-section country method. The method assumes that given the dominant pattern of pharmaceutical consumption by regions, the current medium and small sized pharmaceutical markets would tend to follow in the longer term the consumption pattern of the current largest markets in the respective region.

Since consumption is valued in US dollars, the selection of the time span from which it is calculated the dominant pattern of pharmaceutical consumption is critical. The time span chosen is between 1972 and 1976, for it represents the sort of "intermediate" period that may characterize the two decades ahead. It covers from the ending of the US dollar stability and fixed exchange rate (in 1972); through the emerging of the more marked characteristics of this decade: floating exchange rates and apprehensive speculation, and the rising of production costs faster than prices of products compounded by toughening government regulations; until the exchange conversions into US dollars created sensible distortions between stronger and weaker currency countries (around 1976).

The method relies on GDP/capita by regions and their main countries to be projected to the years 1985, 1990 and 2000 using two sets of hypotheses. Hypothesis A depicts regional growth rates required to attain the Lima goal obtained from UNIDO's LIDO model. Hypothesis B gives regional growth rates using Leontieff's scenario X, showing future developments based on past trends alone.

Then it correlates GDP/capita with pharmaceuticals consumption/capita for the region and the countries whose markets represent from 60 per cent to 80 per cent of the regional total, for the five years of the chosen period.

A test fit equation is then calculated by regions showing the more plausible pharmaceutical consumption path for each region. Consequently, the corresponding regional consumption for the projected years is calculated based on the GDP/capita growth rates given under the two hypothes s above.

This report only presents consumption forecasts without attempting to put forward hypothes s of possible future production taking into consideration technical, social, nutritional, environmental, etc. aspects. They will be given later in the First World-wide Study on the Pharmaceutical Industry when the ongoing analysis on health and socioeconomic aspects will be completed.

1.4 Typology

The purpose of the typology is to classify the countries in order to ensure intersectoral comparability and to highlight the particular characteristics of the pharmaceutical sector.

To this end a simplified version of the major area and region geographical classification of the UN, Department of Economic and Social Affaires, Population studies, was adopted. The regions considered are the following:

adopted regions	corresponding UN regions
(a) North America	North America
(b) Western Europe	Northern, Southern and Western Europe excluding Yugoslavia
(c) Other developed countries of market economies	Japan, Oceania, South Africa and Israel
(d) Centrally planned economies of Eastern Europe	Eastern Europe, USSR and Yugoslavia
(e) Africa	All African regions excluding South Africa
(f) Asia	All Asian regions excluding Japan and Israel
(g) Latin America	All Latin American and Caribbean regions.

Although the regions are left in their geographical composition, a further distinction between developed and developing countries is made, and within the former between market economies countries and centrally planned ones. The first fourregions correspond to the developed countries, while the remaining three regions correspond to the developing countries.

2. WORLD CONSUMPTION OF PHARMACEUTICALS

Pharmaceuticals' consumption can be assessed in two ways: according to health needs of the whole population and according to the existing demand for pharmaceuticals.

(a) The former may distiguish three levels of health care according to the needs of the population and the degree of health coverage countries can afford. One, hospital-based curative care relying on expensive equipment and drugs, is mainly prevalent in countries of market economies. Of those, only the developed ones can afford a universal population coverage whilst developing countries can only afford a fraction of it, around 70 per cent for Latin America, 25-30 per cent for Asia and 15-20 per cent for Africa. Two, out-patient health units-based preventive care relying partly on hospital-based care and partly on policlinics, dispensaries and large scale immunization programmes, is mainly prevalent in countries of centrally planned economies. Most of these countries can afford a near universal population coverage not only because this approach is substantially less expensive that the first one but because they allocate a larger percentage of their national budgets to health needs. This is the case of Eastern European countries, Cuba and China. Third, primary health care that endeavours to make essential health care universally accessible to the population. It introduces social and economic dimensions in what was previously mainly health concerns. It means much more than extending basic health care services for it incorporates social and economic goals and involves governmental and community efforts towards its achievement. Its practical application entails a thorough review of the health system and its main components : health care delivery, environmental health and nutrition. Consequently, the proportion of expensive medical equipment and drugs needed would be substantially reduced in relation to the two previous health care approaches. This approach has evolved over the years in the light of the experience gained in many developing countries, and it is delivered by community health workers. So far it has not been fully applied in any developing country although major elements of it are in place in several countries. The World Health Assembly has endorsed this drive towards primary health care and WHO with the support of governments, institutions and other UN organizations will strive during the next two decades to achieve health for all by the year 2000 by putting it into practice.

(b) The existing demand for pharmaceuticals, that in the main also covers
health needs although only for a fraction of the entire population, has consumption
patterns that differ widely between countries and regions for they use various
medicines differently priced to treat fundamentally the same prevailing diseases.
Furthermore, morbidity patterns between developed and developing countries
are basically different. The first involves mainly non-communicable diseases
linked to particular life styles, whereas in the latter it prevails communicable
diseases linked to undernourishment, environmental health shortcomings and
lack of adequate immunization coverage. Field research and case studies carried
out over the past two years by UN Organizations in many developing countries
have found out that pharmaceuticals consumption figures are quite in excess of
the amounts required to meet the real health needs of the fraction of the
population covered by health delivery systems. This is due to several factors
such as levels of affluence by population strata, type of disease and preferred
medicament, cultural and social patterns in urban and rural areas, wide spread
self-medication, influence of intensive advertising, etc.

2.1 Appraisal of health needs

Pharmaceutical requirements based on the existing health needs of populations
can be estimated in terms of prevailing disease patterns, its total treatment
in terms of clinical therapeutic standards and pharmaceuticals supply requirements
to cover most if not all of the population in need. These estimates should
later on be corrected according to health care delivery chosen.

Based on WHO's health statistics, the morbidity patterns have been determined
by regions in developing countries. Annex 1 presents the comparative morbidity
patterns for the 25 main communicable diseases that constitute an international
health risk. As a comparison, Annex 2 gives the corresponding morbidity pattern
in the United States as representative of the developed countries.

WHO statistics on crude morbidity by countries refer only to communicable
diseases as reported to health institutions thus covering only a small fraction
of the affected population. Nevertheless it provides useful clues to relative
incidences and geographical concentration of diseases. Further work on
general morbidity, its breakdown by main categories of diseases and its
stratification by age groups are key factors in determining regional health
needs and the more vulnerable groups such as children, childbearing women and

the aged.

From there on, a selection should be made among the drugs that deal effectively with at least the 25 main communicable diseases and their amount required should be quantified in terms of total therapeutic treatment and population coverage.

These drugs should be selected according to the criteria given in WHO's Essential Drugs List, and preferably from among the 209 essential drugs therein included.

Ideally, if developing countries could harmonise their prescription practices, then larger regional markets could be created for a limited number of drugs, thus enabling its economic production in the region. Otherwise the existing market atomisation in drug prescribing will maintain the developing countries as net importers and/or costly producers.

However, the erradication of communicable diseases in developing countries poses, among others, as a major economic problem to the world. Although communicable diseases were practically erradicated from the developed countries over 50 years ago and effective pharmaceuticals, therapies and immunologicals exist for many of those diseases, relatively little has been done to apply them in many developing countries due to economic constraints. WHO's successful erradication of small pox, carried out with intensive international participation, is currently being applied in its expanded Programme on Immunization covering 6 other health scourges.

Nevertheless, poverty and limited foreign exchange resources coupled to inadequate distribution of healthcare personnel and facilities have become the main obstacles. Annex 3 presents the regional patterns of morbidity for the 25 main communicable diseases for countries with less than US$ 300 as income per capita in 1977. These are in the main the poorer countries that may not be able to pull through by themselves in erradicating those diseases, and whose affected population was over one billion people in 1975.

2.2 Development of the demand for pharmaceuticals

The demand for modern pharmaceuticals grew out of two main developments in medicine: the dominance of physiology and the theory of specific aetiology.

(a) The first, marked the separation of the mind—body interrelationship that for thousands of years dominated the healing practices of primitive medicine men. The passage from early medical practice to scientific medicine put the study of physiology on the forefront whilst the mind component was casted out from serious research until the advent of psychology and psychiatry. Consequently, this split gradually conditioned physicians and patients that ailments had either physical or mental causes, two separate departments.

By the end of the 1930's developments in psychoanalysis and hypnosis brought the mind back into focus with the concept of psychosomatic, linking up again mind with body. Moreover, medical research found out that at least 75 per cent of human illness were mentally caused[1].

More recent surveys have shown that "about 75 per cent to 80 per cent of patients seeking medical attention have conditions that will clear up anyway or that cannot be improved even by the most potent of modern pharmaceuticals". [2]

Further developments in macromolecular psychiatry and experimental psychology have stressed this point further.

(b) The theory of specific aetiology, presented by Pasteur and Koch, states that particular diseases have particular causes. Thus started off the new discipline of microbiology which task is to discover the causative agents of disease, with much of microbiology and toxicological research having been influenced by the four postulates of Robert Koch.

Thus it was born the principle of specific therapies based on the manufacture of chemical weapons able to deal with particular pathogens, active drugs that searched their targets on their own accord without injuring anything else. The application of specific aetiology that has dominated the growth of modern medicine over the past 100 years, has had a string of successes from the beginning of this century , ranging from the discovery of sarvasan to sulpha drugs, antibiotics, vitamin deficiencies, hormones, etc. The increasing demand for these and other drugs brought forth the modern pharmaceutical industry.

1/   "Mind and Body: Psychosomatic Medicine" and "Emotions and Bodily Changes" both from Dr. Helen Flanders Dunbar.

2/   "Beyond the Magic Bullet", Dr. Bernard Dixon, New Scientist, 7 September 1978, page 701.

However, specific aetiology seems to be running into trouble as research in medicine, psychology, biology and developments in the nervous and brain systems have shown that nutrition, environment, bodily constitution, age and many other factors determine the pattern of communicable and non-communicable diseases and individual susceptibility to them. [3]

Moreover, the main non-communicable diseases prevalent in developed countries such as cardiovascular disease, cancer, mental illnesses, represent areas where this theory has failed.

The above realisation brought back into focus the importance of that twin arm of medicine: "the interpretation of ill health in terms of bodily disharmony or social deprivation". [4] Research done by Professor T. McKeown on the decline of mortality in the UK has shown that the larger proportion of the fall was achieved through improved nutrition and environmental health before modern medicine could make significant contributions.

2.2.1 Regional evolution of pharmaceutical consumption

The development presented in the preceding heading shaped up by the 1940's the modern health care system in its two main modes: curative and preventive care. Both are based on hospitals, dispensaries, active drugs and immunologicals although with different emphasis and costs.

Additionally, two other factors played an important role in the pharmaceutical consumption of developing countries: economic restrictions and inadequate distribution of health care personnel, facilities and pharmaceuticals.

Concerning the first, a comprehensive survey carried out in 65 developing countries showed that 26 per cent of them had an annual per capita expenditure for total health care of less than US$ 1 in 1975. [5] Moreover, the total consumption of pharmaceuticals by developing countries represented 0.78 per cent of their corresponding GDP in 1976. Furthermore, foreign exchange constraints further limited the amount of dosage forms and bulk drug imports

[3] "Beyond the Magic Bullet" by Dr. B. Dixon, Allen and Irwin, 1978.

[4] op. cit in 2.

[5] "Health", The World Bank, Washington, 1975.

and consequently the pharmaceuticals supply to populations. In recent years the skyrocketing of health expenditures has forced even affluent developed countries to slash down costs, and pharmaceuticals have become one of the main targets.

Regarding the second, in many developing countries health distribution systems are often inadequate due to several factors such as difficult topography, transport defficiencies, lack of refrigerated storage facilities, delayed inventory recording that often create "out of stock" situations, etc. Consequently, a number of moderately priced and effective pharmaceuticals are not made available to the poor, not because of their price but due to defficiencies in the distribution system.

The consumption of pharmaceuticals by regions from 1960 to 1978 is given in Annex 4. The main characteristics of the demand for pharmaceuticals are shown in Annex 5.

In broader terms, the regional evolution of consumption is as follows:

Africa comprises two well differentiated areas, Black Africa and Arab Africa.

The former area is impoverished with health care being supplied to only 10-15 per cent of the population mainly in urban areas. The rest relies on traditional medicine for relief of their ailments. The larger countries of this area are promoting traditional medicine along the lines of successful Asian countries such as India, China and Pakistan, where this type of medicine is an integral part of their health care system. This area with roughly 2/3 of the African population and 1/3 of pharmaceuticals demand had the lowest consumption level at a bit over US$ 1 per capita in 1977.

The latter area provides modern health care to the majority of its population with minimal reliance on traditional medicine. It is the most dynamic area in this region with a consumption level of around US$ 7 per capita in 1977.

The region as a whole has grown 12 per cent during 1970-1978 with relatively less distortion in its consumption figures from 1976 onwards due to the exchange rate fluctuations. Its consumption level has been steadily growing from US $ 1.4 per capita in 1970 to $ 2.5 per capita in 1977, a 79 per cent growth over the period. However, its regional share in world consumption diminished from 1.8 per cent in 1970 to 1.6 per cent in 1978 and 11 per cent reduction over the period.

Asia may be divided into three areas · the Indian subcontinent, the
open market countries and the fast growing countries.

The first area includes the poorer countries of this region dominated
by India, and accounting for about 2/3 of the Asian population excepting
China. The largest countries in this area, India, Bangladesh and Pakistan
have a sizeable modern health delivery system although it covers only around
25 per cent of the population. The massive task of extending those services to
the majority of the population is at the moment beyond the economic means of
these countries. To partially compensate it, they have legalized and developed
their traditional medicine including formal studies and special factories for
its products. In this way modern and traditional medicines provide care to
the majority of the population. Its consumption level was around US $ 2 per
capita in 1977.

The second area includes mainly the ASEAN countries that provide health
care to about 30-35 per cent of its population. They partially rely on
traditional medicine producing its medicaments in special factories although
without its comprehensive incorporation into the health system as practiced
in the previous area. Its consumption level was around US $ 3.5 per capita
in 1977.

The third area includes Arab Asia, the exporting countries such as
Korea, Hong Kong and relatively advanced countries like Turkey and Iran.
They provide health care to the majority of their population with minimal
reliance on traditional medicine. It is a dynamic area with a consumption
level of over US $ 10 per capita in 1977.

The region as a whole grew   19 per cent during 1970-78 with an upward
distortion on consumption figures due to exchange rate fluctuations. Its
consumption level grew 2.46 times over the period 1970-77 from US $ 1.3 per
capita in 1970 to $ 3.2 per capita in 1977. Its regional share in world
consumption reflected its dynamism by increasing 1.47 times between 1970-78
to 7.2 per cent in 1978.

Latin America is the more homogeneous and relatively more developed
of the developing countries regions. It provides health care to a large proportion
of its population with marginal reliance on traditional medicine.

The region's growth rate between 1970-78 has been significantly distorted
due to downward distortions in its exchange rates and marked devaluations in

two of its more important countries: Argentina and Mexico. Hence the
relative stagnation of the region between 1974 and 1977 when measured in
US dollars, although measurements in their national currencies show a large
growth rate after adjusting for inflation.

Nevertheless, the region managed to double its consumption level
between 1970-78 up to $ 11.2 per capita in 1978, the largest of the developing
countries. Its consumption level is about twice that of the combined consumption
levels of the other two developing countries' regions. However, its regional
share in world consumption dropped behind Asia in 1978, reflecting the
foreign exchange distortions pointed out above.

Eastern Europe is a homogeneous region that provides health care to almost
the entire population using mainly preventive health methods, although there
is a growing trend, similar to Western Europe, to use other medical approaches
as well, such as herbal medicine, naturopathy and regenerative cures, etc.
The region grew 12 per cent per annum between 1970-78, and more than doubled
its consumption level between 1970-77 up to US $ 31 per capita in 1977. Little
currency distortions affected the region for it maintained a certain stability
in relation to the US dollar.

Developed countries of market economies, that groups its three regions
North America, Western Europe and other developed countries, is a relatively
homogeneous area that provides almost universal health care to its population, using
mainly curative health methods. However, Western Europe shows more markedly
than the other two regions, a host of medical approaches such as homeopathy,
naturopathy, regenerative cures, spa resorts, herbal medicines, etc., all
flourishing although the heterodox medical approaches require cash payments
from patients whereas the orthodox medical approach relies chiefly on health
insurance reimbursement.

It is the main consuming area with about 2/3 of world consumption of
pharmaceuticals. It grew 12.6 per cent during 1970-78 but with a different
dynamism between the regions. Of them, Japan showed the fastest market growth
thus heavily influencing the growth pattern of the other developed countries
region. Likewise, all the other regions but North America showed large
gains in consumption due to currency fluctuations for the major countries have
stronger currencies than the US dollar. The year 1978 was particularly
favourable for Western Europe.

2.2.2 Main therapeutical groups

Up to the 1930's the number   known pharmaceuticals was relatively reduced. However, from the 1940's up to date the number of pharmaceuticals became very large.   During the 1960's there were about 20,000 pharmaceuticals in the markets of several countries, many of which were dosage variations of few drugs. From 1970 on, fast rising health expenditures strained the health budgets of most, if not all countries. Consequently, it began a cost cutting process on pharmaceuticals that is trimming its numbers to few thousand of medicines in most countries.

In open market countries it has been estimated that about 2,500 pharmaceuticals formulated from around 800 drugs account for about 90 per cent of consumption. Of these, 500 broad spectrum drugs account for over 80 per cent of all prescriptions.

For example, the Italian Prontuario Terapeutico included in Italy's Law 484 of 5 August 1978, lists 352 drugs in 922 formulations and 1,630 dosage forms as those pharmaceuticals therapeutically essential for a significant proportion of the population.

All the drugs and pharmaceuticals are categorized by therapeutic groups, with wide variations between the number of groups included in each country. Since the market breakdown by therapeutic groups is known for 20 countries, only a typical estimate can be given by main groups for pharmacy and hospital use.

Table 1 gives the main therapeutic groups for pharmacy markets.

Table 1 Main therapeutic groups in pharmacies, average 1975-77 (in %)

Therapeutic Group	Share of the market (% range)	
	Developed countries	Developing countries
Anti-infectives	9.0 - 15.0	20.0 - 24.0
Central nervous system	18.0 - 29.0	4.0 - 9.0
Analgesics and antipyretics	4.0 - 5.5	5.0 - 9.0
Cardiovasculars	8.0 - 12.0	4.0 - 6.0
Vitamins and tonics	3.0 - 8.5	5.0 - 12.0
Hormones	3.5 - 7.0	3.0 - 6.0
Neoplasms and endocrine	10.0 - 13.0	6.0 - 10.0
Digestives and genitourinary	9.0 - 11.5	9.0 - 12.0
Respiratory system	6.0 - 10.0	3.5 - 7.0
Dermatologicals	2.5 - 6.0	3.0 - 6.0
Blood and blood forming	2.5 - 4.0	2.5 - 4.5

Table 2 gives the main therapeutic groups for hospital markets.

Table 2 Main therapeutic groups in hospitals, 1976 (in %)

Infusion solutions	20.0
Anti-infectives	13.0
Psychotropics	10.0
Blood diseases/tumors	9.0

In pharmaceutical consumption there is no market dominance by one
individual medicine, although the 25 most prescribed pharmaceuticals on the
average account for 30 per cent of the market. However, at the therapeutic
category level often between 1 and 5 pharmaceuticals account for over 2/3
of the total market for most categories.

2.3 Pricing of pharmaceuticals

The pricing of pharmaceuticals has become the main concern for both
governments and industry. In the developed countries, governments exert
varying forms of control over pharmaceutical prices such as direct price
controls, flexible pricing schemes controling the levels of profit, the
maximisation of price competition trough encouragement of multi-source
pharmaceuticals supply, differential pharmaceutical reimbursement by the
health insurance system at the lowest supply level, etc. The pricing controls
have ranged from ordering general or selective price reductions, to imposed or
voluntary price freezes, restricted price increases without government approval,
and differential pricing systems based on therapeutic significancies or novelty.
In the developing countries, most countries have direct price controls although
fewer countries can actually enforce them, while many countries have other forms
of price controls such as centralized buying for the entire country needs,
public tendering for public sector needs, controls on imported drugs and
pharmaceuticals, etc. The pricing controls usually involve imposed price
freezes, selective price reductions, differential pricing systems for open
market pharmaceuticals and social medicines (often for free distribution or
token prices), and restricted price increases without government approval.
The industry has shown voluntary restraint to avoid tougher governmental

controls although defending its position to the hilt.

The pricing problem revolves around the costing of pharmaceuticals.
Research-based manufacturers argue that the price of pharmaceuticals bears
no relation to direct production costs, for their main expenses are on
"central costs": research and development and overhead costs. The allocation
of these central costs to the individual pharmaceuticals represents price
transfers according to company policy. The problem is compounded further
by the need to generate enough cash flow to defray the skyrocketing costs of
immediate future research. Standard drug-based manufacturers usually go under
the price umbrella of the first group to negotiate later the price discounts
according to the circumstances for they have much smaller central costs.

Governments are seldom amenable to grant the price transfers requested
by industry unless manufacturers open their company books to substantiate
the claims. Customarily industry prefers to keep the books for itself on
the argument of protecting its trade secrets. Therefore, governments have
evolved a weighting factors approach to fix the price increases. Industry
has no choice but to go along with them.

In the case of the developing countries, that almost entirely depend
on the international industry to get their pharmaceuticals, drugs and
intermediates, the industry often adopts a take it or leave it attitude on
export prices. Consequently, developing countries have no real alternative.
Therefore a situation arose, whereby developing countries are strengthening
their bargaining power through measures such as centralized purchasing,
public tendering, etc. within the restrictions of their limited foreign
currency budgets, whilst the industry in general fixes its export prices
according to the company policy and to what the market can bear after
considering factors such as the economic conditions of the country, pharmaceutical
market size, currency standing, existing legislations, its market share, etc.
Hence the prices of the same pharmaceutical can be very different according
to the various suppliers, and prices of the same pharmaceutical by the same
manufacturer can also be very different in various countries. This also
explains why pharmaceuticals are primarily sold on spot markets except for
few longer term contracts accorded to some Eastern European countries.

3. WORLD PRODUCTION OF PHARMACEUTICALS

The pharmaceutical industry that contributes significantly to the
safeguarding of health and the alleviation of pain is a moderately-sized
industry by sectoral standards.

The main characteristics of this industry are four: the production of
life saving drugs; the development of aetiologically effective drugs for
improved therapies brought about by research; its production complexity to
produce ever purer drugs from a multiple choice of alternative chemical
structures, processes and raw materials; and its legal position based on
responsibility and accountability for the drugs and pharmaceuticals it produces,
that give the industry its functional monopoly granted and upheld by
governments.

The success of the new therapies got the approval and enthusiastic
consent of the public opinion, it effectively substituted most of the
existing traditional medicines, and gained new and wider markets through its
key role in upkeeping the health of the more affluent segments of the
population. Regretably its beneficial effects could not be entirely extended
to the poor due to limitations in purchasing power and often inadequate
pharmaceuticals' distribution systems. In the past 30 years the industry's
main source of growth has come from product upgrading, that is to encourage
the use of new, more effective, more expensive and more profitable drugs.
Additional growth sources came from innovative breakthroughs mainly during
the 1950's and 1960's that created or expanded markets, and the increase in
the number and the volume of prescriptions in parallel to the rising in the
number of physicians.

3.1 Development of the pharmaceutical industry

The modern pharmaceutical industry began early in this century when
research on some dyestuffs showed promising results according to the principles
of the specific aetiology. The success of Sarvarsan against the syphillis
synthetized by Paul Ehrlich in 1911 marked the beginning of the new era of
active drugs. Before it, traditional drugs could cure few diseases for they
relied in reducing sympthoms, easing pain and letting the body to cure itself.

However, the real advent of the modern chemotherapy was delayed for 25

years until the discovery of the sulfanilamide's antibacterial properties
in 1935, to be followed 8 years later by the introduction of penicillin.
A string of broad-spectrum antibiotics followed as well as many other
drug breakthroughs in therapeutical groups such as tranquillizers,
steroids, hormones, cardiovasculars, etc. during the 1950's.

The impact of these advances on the social and economic life were so
persuasive that the industry took for granted the approval and consent of
public opinion on its actions. However therapeutical catastrophes traceable
to the new drugs brought public criticism and gov.rnmental regulations along
with a sharp conciousness for widespread controls on the safety and effectiveness
of the new drugs.

The elixir sulphanilamide mishap in 1937 brought in the U.S. regulations
on drug safety. The thalidomide disaster in 1961 produced in the U.S. new
regulations on drug safety and efficacy through extensive clinical testing,
and a monitoring process to regulate the developmental phase of research on
new drugs. These measures later on spread out on the world. Consequently,
in the last 20 years the industry became the object of criticisms over its
economic and therapeutic performance initially in the developed countries and
later followed by the developing countries as well. Since then debates over
the role of medicine on therapy and society, over the ways to maximize the
introduction of new and more effective drugs and pharmaceuticals, and over the
cost and financing of research and production have been the dominant themes.
These debates could be grouped into three broad categories:

(a) Socio-political discussions, in relation to what the public and
governments perceive a the monopolistic character and practices of the
industry, particularly concerning transfer pricing, profit levels, costs of
research compared with those for promotion and advertising, and the
encouragement of pharmaceuticals' overconsumption through intensive promotion.
Furthermore, the straining of health insurance budgets on most countries have
brought increasing pressure to reduce health costs. It initially concentrated
on reducing pharmaceutical prices only, but later on it spread to reducing
in-patient hospital costs and regulating the amount of physician's prescribing.
Additionally it is bringing a shift away from the expensive hospital-based
curative health care towards preventive care and primary health care.

The emphasis on reducing pharmaceuticals' prices stems from the public
and the governments' perception of them in absolute terms rather than in the
percentage price increases as presented by industry. Although pharmaceutical

prices have grown slowlier than the general price index in most countries, the average value of a pharmaceutical product is several times bigger than the average value of the goods that predominate in the general price index. Hence a one per cent increase in the pharmaceuticals' price may be equivalent, in absolute terms, to 5 or 10 per cent increase in the general price index. And this difference is readily preceived by those who have to pay in hard cash.

In the developing countries the debate centers on differential export pricing of pharmaceuticals and drugs by large manufacturers, insufficient research to develop new drugs and therapies more effective against prevailing tropical diseases, and the need to extend the benefits of modern medicine and pharmaceuticals to needy populations lacking from enough purchasing power. Hence developing countries have enacted a host of legislations aimed at encouraging this industry in a controlled way, to increase their manufacturing technology and to explore ways of improving their national policies.

(b) The ethical debate that concerns the safety and effectiveness of modern drugs and the decisions about who shall control them. In recent years this concern has been extended to drug quality and bioavailability as well. Governmental regulation has been introduced in many countries in direct and indirect ways concerning drug safety, effectiveness and quality and there is pending legislation on bioavailability.

The main point of this debate is that no manufacturer should reserve for itself the role of controlling the quality of the drugs it produces, provided that the drugs have been certified as safe and effective for human consumption. Independent bodies should carry out the task of inspecting and certifying the quality of drugs in the public interest, to avoid that manufacturers become judge and part at the same time.

This task is being carried out in the developed countries. However, not all developing countries have regulations on this matter, and many of those which have quality control legislation lack resources and trained personnel to carry out the inspections. Consequently most developing countries still depend on manufacturers alone for the assurance of drug quality.

(c) The economic debate, central to this industry, came up from the wide ranging impact of research and development in chemotherapeutics that changed the character of the pharmaceutical industry and helped to spread its transnational operation producing a de facto internationalization of production.

Consequently a large array of often heated debates arose particularly
concerning the interpretation of price mechanisms, with large price differences
for basically the same drug and drug intermediates; the reality of market
competition by prices, product differentiation and diversification of
products; the internationalization of production and the transfer of
technology conditions ; the characteristics of a market supplied by a
complex oligopolistic industry where passive consumers receive pharmaceuticals
selected by physicians and financed by health insurance systems.

The above debates, compounded by expanding health services, the need
for cost constraint on health expenses, and the growth of pharmaceutical
production in developing countries have had marked effects on the structure of
this industry. One of the main results on industry has been the substantial
reduction of cash flow for research made ever costlier by stringent regulations,
fast rising production costs and diminishing profits due to relatively slower
price increases and foreign exchange fluctuations. The industry's response
has been the adoption of a strongly defensive position to protect both the
fruits of innovation and what it preceives as a threat to its future survival.

All the above helps to explain the industry's cloud of secrecy on its
operations, the logics of patent defense, of differential prices and price
transfers, of brand names and marketing arrangements, of intensive promotion,
etc.. It also helps to explain governmental actions regarding price fixing for
pharmaceuticals, regulation of profit levels, the encouragement of generic
names, the therapeutically equivalent lists, the differential pharmaceuticals
reimbursement lists, the reduction of the number of dosage forms on the
market, the setting up of national formularies and basic drug lists, etc.

3.1.1 Evolution of pharmaceutical production by regions

The world production of pharmaceuticals has shown a rapid increase during
the past three decades. However, this development has taken place in the
main in developed countries of market economies that accounted for about
70 per cent of world total during the 1970's, followed by the developed
centrally planned economies with 19 per cent and the developing countries
with 11 per cent.

Annex 6 shows pharmaceutical domestic sales for 20 large countries as

given bv IFPMA. Annex 7 presents the production of pharmaceuticals by
regions from 1960 to 1978. Annex 8 gives the main characteristics of
pharmaceuticals production by regions, including regional self-sufficiency,
that is the proportion in which regional production meets regional consumption
of pharmaceuticals.

From Annex 7 it can be seen that the world production between 1960 and
1978 grew at an average of 11.3 per cent per year. From 1970 to 1978 the
world production grew 13.1 per cent per year, with developing countries
showing an average growth of 17.5 per cent for the period compared with
12.7 per cent of the developed countries. However in absolute terms, the
developed countries increased their production 6.4 times comparing it with
that of the developing countries during 1970-78.

3.1.2 Share in world production of pharmaceuticals

Annex 8 shows that the developing countries share in the world pharmaceutical
production grew from 8.6 per cent in 1970 to 11.7 per cent in 1978, a smaller
share than that of its consumption. Of these, the fastest growing region is
Asia where after being second to Latin America for over 25 years, it took
the later region over in 1977, thus becoming the largest developing country
region.

Concerning the developed countries, Western Europe and Other Developed
regions showed the largest share gains at the expense of North America.
Of these, North America lost its first place, held from this industry's
inception on, to Western Europe in 1969 as the largest developed country.
region. The later region currently accounts for 35 per cent of the world
production, although part of this value is due to favourable exchange rates
in relation to the US dollar.

There is an on going analysis on production and consumption in constant
US dollars to appreciate the magnitude of currency exchange deviations and
correct the figures accordingly.

3.1.3 Production capacities

There are about 15 countries with a highly developed pharmaceutical industry,

60 countries with an industry in various stages of development, and remaining countries that have none or minimal pharmaceutical production activities.

Among the developing countries, 45 countries have no pharmaceutical production and only rely on imports; 43 countries have packaging and formulation industries with few of them having some production of bulk drugs from late intermediates, while only 7 countries have a real foundation for this industry, but their pharmaceutical production is carried out in the main by multinationals through direct investments and licensing agreements.

The largest number of formulation plants are in Latin America accounting for almost 50 per cent of the developing countries, followed by Asia with about 40 per cent.

Concerning bulk drug production plants Asia represents around 50 per cent followed by Latin America with 45 per cent.

3.2 Structure of the pharmaceutical industry

3.2.1 The concentration of world production

Currently there are over 10,000 firms in the world that may be broadly considered as pharamaceutical producers. Of these, not more than 3,000 can be considered as competent pharmaceutical manufacturers, while 110 top companies supply around 90 per cent of the world production, 100 of them in the market economies countries and the rest in the centrally planned ones.

A recent presentation to the US Academy of Sciences' Institute of Medicine by IFPMA's latter president Tiefenbacher showed the degree of market penetration or market share achieved by the leading pharmaceutical multinationals by regions. They are given in table 3.

However, the identification of the world's major pharmaceutical manufacturers presents two main difficulties. One, most leading manufacturers are quite diversified with varying contributions from pharmaceuticals to overall company sales. Consequently, these companies have substantial flexibility in shifting costs and resources from one product line to another according to company policies in order to maintain or gain market share in particular market segments. Two, manufacturers are ranked according to size, that is, only on/the volume of their pharmaceutical sales. However large

discrepancies occur in the ranking procedure due to various definitions
of pharmaceuticals and the need to estimate pharmaceutical sales when
disaggregated company data is unavailable. Presumably, table 3 refers to
pharmaceuticals as ethical medicines in the prescription-only category according
to the manufacturer's definition of ethicals.

Table 3 — 1977 share of regional pharmaceutical markets by leading
manufacturers

Region	Market shares in per cent by top companies		
	top 10	top 20	top 30
North America	38.7	66.6	75.3
Western Europe	26.3	34.9	44.4
Latin America	28.4	47.0	56.3
Africa, Asia and Oceania	12.5	24.3	39.1
Total world[1]	27.4	43.0	53.6

1/ Note: excluding Centrally planned economies.

Among the largest 50 companies that represented over 2/3 of the
world production in 1977, the US accounted for 48 per cent of the total,
the Federal Republic of Germany for 17 per cent, Switzerland for 12 per cent,
Japan and the United Kingdom for 7 per cent each, France for 4 per cent and
others for 5 per cent. [6]

At country level, foreign-owned companies account on average between
70 to 80 per cent of the developing countries' total pharmaceutical
production.

3.2.2 The dynamics of the industry: innovation

The engine of pharmaceutical development is the continuous innovation
towards safer and more effective drugs to combat prevailing diseases and to

6/ "Transnational Corporations and the pharmaceutical Industry" ST/CTC/9,
UNCTC, 1979, page 112.

extend the life span of healthier populations.

Drugs by themselves are not a panacea and cannot do anything permanent unless environmental sanitation and nutrition are improved. However, its contribution to erradicate disease is important, and in the case of life saving drugs its contribution becomes critical. The scientific framework of drug innovation stems in the main from physiological research and specific aetiology.

Physiological research provides the basis for linking the drug's chemical structure with its specific pharmacokinetic properties. It shows the biochemical and electrophysiological mechanisms activated by the drug and what part of the body's organs system it attacks. Nevertheless, on many drugs it is only known how they work but not why they work the way they do.

Specific aetiology establishes a causality relation between microorganism and disease by using the missing factor method and then it extrapolates the results of clinical trials on animals to humans. The missing factor method designs experiments involving a defined number of factors and then tests them one by one against the disease. The causality is proved when one factor is found which presence produces the disease and which absence or missing produces no results. The clinical trials are designed to assess the toxicological properties of chemical substances concerning their safety for human use. However, the extrapolation of results on animals to humans has two drawbacks. One, the logic of the extrapolation is based on equating smaller drug doses over the longer human life span to larger drug doses over the shorter animal life span. However, there are no causality reasons that justify this equating when even more, the larger drug doses to animals often overrun their body's defense system without proving if it is safe or not for human use in human doses. And yet, the interpretation of toxicological data of clinical trials on animals is the dominant factor in the approval or rejection of new drugs. Furthermore, the lengthier and costly toxicological testing procedures are increasingly questioned by leading authorities in the field who consider that "test methods included in official regulations were drawn in a hurry and without careful scientific scrutinity. [1] New and more humane short-term tests are available but have not yet been incorporated into official regulations.

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[1] "New developments in toxicology", Prof. Gerhard Zbinden, Swiss Pharma, Nr. 9, 1979, pp 17-21.

Two, animal organisms however close they may be to human ones, are not the same, whereby results obtained with animals are not always validated in humans concerning drug efficacy.

There are four main sources from which almost all modern drugs have come out. They are:

(a) The analysis of traditional medicines in the search for their active principles.

(b) The results of biological research particularly on physiological research as explained above. This is by far the most important source for new drugs.

(c) The results of drug screening in its two modes: general and special screenings.

(d) The physician's observation of patients chiefly in hospitals.

This innovate drive has brought two distinctive effects: one, a strongly defensive position from industry to protect, at all costs, the fruits of its research efforts mainly concerning patents, brand-names and adequate pricing. Two, strong regulatory actions by governments to safeguard human health and constraint soaring health costs.

The turning point for new drug introductions and the fast rising research costs was the 1962 Kefauver-Harris Amendment in the U.S. It introduced tough drug safety measures after the thalidomide disaster, new drug efficacy measures and a monitoring process for the developmental phase of new drug research. For instance, in the U.S. the world's largest market, between 1940 and 1978, 1,006 new single chemical drugs were introduced into the U.S. market. The yearly rate of new drug introductions is as follows: 18 entities from 1946-50, 31 entities from 1951-55, 39 entities from 1956-60, 20 entities from 1961-65, 12 entities from 1966-70 and 10 entities from 1971-75.

The US drug safety measures that later on spread to other developed countries, incorporated exacting toxicological and pharmacological data on all phases of clinical testing on animals. For instance, in the last decade documentation submitted before a new drug could be registered was about 500 pages. In 1979, documentation requirements grew to 100 times that amount, the extreme case being the U.S. were 70,000 pages are now required. The development of a new drug 10 years ago took on average 6 to 8 years and cost about US $ 3 million; in 1979 this development takes from 10 to 12 years

at around US $ 60 million, of which at least half is spent on drug safety
research. Likewise, the drug-kill ratio has greatly increased, for a decade
ago from 2,000 new chemical entities 1 could be introduced into therapy;
in 1979 the corresponding figures are 10,000 new entities for 1 new therapy.
Meanwhile, a company's market risk has increased as fewer new drugs actually
merge from research whilst, as patents expire, increasing competition
emerges.

In the developing countries there is nothing comparable to clinical
testing as required in the developed countries. They do accept the latter
drug marketing approval as a key input in their drug and pharmaceuticals
registration procedures.

3.2.3 Patents and brand names

Patents and brand names are the two main instruments through which
international pharmaceutical manufacturers protect the fruits of their research
efforts. The first affords a limited time protection, currently 20 years,
whereas the latter provides sort of permanent protection to both pharmaceuticals
and manufacturers through image-forming and brand loyalty.

The research-based manufacturers claim enforceable patent protection for
their discoveries because of the relative ease with which a new drug, once
discovered, can be duplicated by other manufacturers. This duplication
often involves slight modifications to the original drug's chemical structure
without achieving significative therapeutic improvements, and yet it may
be claimed to be a "better" drug than the original one. However, in several
cases small molecular changes to precursor drugs detected through drug
screening have produced a completely new drug with effective therapeutical
uses quite different from those of the precursor drug itself.

Patents cover three main areas of the pharmaceutical industry:

(a) Drug entities, that protect new drugs from duplicates, concern the
bulk of the industry's research expenditure.

(b) Process technology, that protects new processes developed to produce
mainly patented drugs. However, new process technologies are also emerging
to manufacture patent-expired drugs.

(c) Drug applications technology, that protects innovations in formulation
and packaging of pharmaceuticals, including image-forming characteristics,

such as brand names, particular color combinations, product dispensing forms, etc.

In the past, patent duration and enforcement varied widely among countries, with only 12 developed countries granting, in the industry's view, adequate protection. Industry is striving for an uniform 20 year patent protection.

However, effective as from 1 June 1978 important changes in the European and International Patent Systems came into effect. [8/] Among those changes are:

(a) the existence of a Western European patent application. Of the 16 countries which signed the treaty, the majority has already ratified it.

(b) the existence of an international patent application, that can be filed under the Patent Cooperation Treaty/is already ratified by most Western European countries, the U.S.A., U.S.S.R, Brasil and 8 African countries.

(c) the international patent application system allows a 20 month delay between the filing of the first patent application in one country and the need to pursue further applications in other countries. Under the previous system, within one year of the first patent filing, full applications had to be made in all other countries in which cover is required, at considerable expense.

Since at the time of first filing a company usually has only preliminary pharmacological data, this one year grace period may become crucial for a company's evaluation fo the new drug's potential before going to the expense of foreign patenting.

Concerning the developing countries, most of them offer inadequate or no patent protection, according to industry. However, developing countries feel constrainted by the way patents are used in the practice. The main complaints levelled are the following:

(i) about 84 per cent of patents granted by developing countries are foreign-owned. Of these , between 90-95 per cent of patents granted are not used at all for production in the developing countries. This over-patenting arises from the research-based manufacturers' patenting as many variations of the original drug as possible, to difficult its drug duplication. Nevertheless, the developing countries feel that this position is used mainly

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8/ SCRIP, May 27,1978, page 5.

to hinder the local production by pre-empting potential competitors and to
secure its market share under favourable conditions. Consequently, the
developing countries feel that the patent laws have legalized a situation
that is not in their benefit.

(ii) Patents that are actually used in production frequently carry
high royalty fees, large charges for technical services and other restrictive
clauses tying capital, technology , equipment, drugs and intermediates, export
prohibitions for products incorporating the acquired technology, and preventing
other activities germane to the economic development of the developing countries.

The most restricting factors in licensing agreements for formulations and
bulk drug production are: export prohibitions, compulsory purchasing of raw
materials for production from the licensor, and "transfer pricing" for raw
materials and technical services. Concerning the last, the developing countries
feel that "transfer pricing" that includes high "central costs" (R + D and
overheads of research-based companies) made to be born by all consumers
including the poor, is not right for much of that expenditure contributes
little to the solution of their major health problems.

(iii) The foreign exchange burden of the above costs, which are larger
that the direct production costs, applies to all developing countries regardless
of economic standing and whether they have national patents laws or not.

3.3 The manufacture of pharmaceuticals

This sub-chapter is in fact a short presentation of some significant
aspects of pharmaceuticals manufacture. It has been prepared from an on going
work that will be included later on in the first world-wide study on this
industry.

3.3.1 The stages of pharmaceutical production

The pharmaceutical flows shown in figure 1, page 6, give an overview of
the production stages of this industry. However, an upstream integration of
pharmaceuticals manufacture may be more useful for the developing countries
endeavouring to establish this indu .

Table 4 gives the seven stages of pharmaceuticals production. Its
classification reflects a logical techno-economic upstream integration of

local manufacture, emphasizing the required local availability of production
inputs at each stage. However the passage from one stage of sub-stage to the
next, often entails a quantum jump in resources needed and technological
sophistication.

Table 4 - Stages of the production of pharmaceuticals

1) Import of dosage forms.

2) Compounding based on imported drugs, usually done at hospitals and
   pharmacies (tinctures, ointments, lotions, mixtures, etc.)

3) Repacking based on imported formulated forms in bulk.

4) Formulations based on imported bulk drugs and/or local raw materials.
    4.1) Simpler formulations, such as galenicals, ointments, tinctures,
         liquids, phytochemicals from locally available medicinal plants
         and other local raw materials.
    4.2) Standard formulations, such as tablets, capsules, oral medications,
         pomades and medical creams, infusion liquids, etc.
    4.3) Sophisticated formulations, such as injectables, ophtalnic preparations,
         aerosols, sustained release preparations, etc.

5) Production of biologicals, such as vaccines and sera, blood derivatives,
   plasma. It often starts with repackaging of imported bulk biologicals,
   mainly vaccines and sera.

6) Production of bulk drugs based on imported intermediates and the local
   availability of heavy inorganic chemicals.
   6.1) From late intermediates (fine chemicals, crude extracts, fermentation
   products), that involve the refining and/or synthesizing the last stages of
   the drug production process.
   6.2) From early intermediates (heavy organic chemicals), involving the main
   synthesis stages for the production of the drug.

7) Integrated bulk drug production based on raw materials and feedstocks.
   7.1) Fermentation processes to produce mainly antibiotics including i's
   enzymes, vitamins, etc.
   7.2) Processing of drugs from medicinal plants and animal organs.
   7.3) Integrated synthetic production from raw materials (gas, petroleum)
   to heavy organic chemicals (early intermediates), to fine chemicals (late
   intermediates) to bulk drugs.

Experience has shown that the passage from sub-stage 6.1 to 6.2
is the more difficult part. Factors such as tecnological sophistication,
the need for adequate numbers of trained technical personnel, the
difficulty of getting production know-how, the pricing and availability of
some key production inputs, the relatively larger plant capacities requiring
substantial new outlets in related indurtries (cosmetics, dyes, pesticides,
etc.) or exports, the existence of input supplying related industries
(petrochemicals, fertilizers, industrial gases, etc.), in-house research
and development laboratories, etc. are critical elements in this passage.
The stages of production will also be used for an analysis of technological
complexities in pharmaceutical manufacture.

3.3.2 The production of bulk drugs

The production of drugs or active substances can be done through three
main technologies:

(a) by synthetic and semi-synthetic processes.

(b) by fermentation.

(c) by extraction from raw materials of animal or plant origin.

A fourth technology, that of recombinant DNA or genetic engineering is
developing rapidly in recent years.

(a) Synthetic and semi-synthetic processes

Over 55 per cent of the existing drugs are produced by these processes.
They involve a multi-stage processing chain including between 7 and 12
processing levels from raw materials (basic petrochemicals: olefins and aromatics)
through intermediates to drugs. It is estimated that about 40 per cent of
the intermediates produced has external market outlets, the remaining 60 per
cent is being processed through to drugs.

The processing chain aims at optimizing intermediates yield in the purer
state compatible to drug specifications, technological possibilities and
envisaged selling price, for production and purification costs grow geometrically
at each processing level.

Synthetic drugs are those produced by chemical processes on chemical raw
materials, such as sulfonamides, antituberculotics, antimalarials, etc.

Semi-synthetic drugs are those produced by chemical processes on natural
raw materials or where the processing includes both chemical and microbiological
transformations. Some semi-synthetic drugs are antibiotics (ampicillins),
most steroids, certain central nervous system drugs, etc.

(b) Fermentation processes

Fermentation is used when the drug cannot be obtained by synthesis or when a drug is more economical to produce by fermentation rather than by synthesis. Fermentation relies on microbiological attack by enzymatic cultures on natural raw materials (animal or plant) although in some cases it is used on chemical substances such as petroleum to produce single cell proteins.

The operation of fermentation plants is fairly complicated and requires higly skilled personnel both to upkeep the enzymatic cultures and to induce them to increase the yield or trittus.

(c) Extraction of drugs from animal or plant raw materials

The extraction of drugs or active principles from plants and animal organs has been achieved late in the last century. By comparison to the other two, it is a simpler technology but requires a high degree of hygiene mainly regarding animal organs. From the economic point of view the extraction of drugs from medicinal plants is usually a more viable proposition than the use of animal organs, provided that there is an adequate supply of quality plants.

However, medicinal plant cultivation and processing is a fairly sensitive undertaking for within a same specie there are wide variations in active content and morphology. Moreover, timing is also important for cropping and extracting for small miscalculations may drastically reduce the active principle content of plants.

The production of synthetic drugs can be done in single-product or multi-purpose plants.

3.3.3 Production costs

There is a marked difference in the production cost structure of synthetic and fermentation processes in their upstream integration.

In synthetic processes, its production cost structure from formulation up to early intermediates makes a drastic change when going from early intermediates to raw materials, for the latter part represents in fact the dominion of the petrochemical industry.

In fermentation processes, its production cost structure from formulation up to fermentation products makes a quantum jump when going upward to fermentation raw materials.

Plant sizes: in broad terms, plant sizes from formulation up to early intermediates goes from few tons/year to about 1000 tons/year. However, from early intermediates to raw materials plant capacities range from 10,000 tons/year to 500,000 tons/year.

Investment: from formulation to early intermediates investments range from US$ 1 million to 50 million. Investments required from early intermediates to raw materials go from US $ 50 million to over 1 billion.

Raw material inputs: in general terms, and depending on the processes applied, 1 kg of drug requires between 3 to 15 kg of raw material inputs. Of these, in volume terms, about 70 per cent are inorganic chemicals and 30 per cent organic chemicals.

Cost structure: concerning direct production costs, synthetic processes up to early intermediates are dominated by fixed costs accounting from 60 to 80 per cent of the production costs. From early intermediates to raw materials variable costs dominate in about the same proportion due to the fast rising prices of feedstocks.

However, specific production cost structures are difficult to assess due to the diversity of product lines turned out by pharmaceutical manufacturers, usually in other chemical related areas. Consequently, "real" production costs are heavily influenced by company policies on cost allocation.

Table 5 gives a typical production cost of the pharmaceutical division of a large multinational manufacturer.

Table 5 - Typical pharmaceutical production cost of a large scale manufacturer

cost items	per cent
material inputs for production	10.0
material inputs for R + D	6.0
purchases of technical information	6.0
other direct costs	5.0
	27.0
marketing costs	
advertising	5.0
distribution ·	7.0
	12.0
value added	
wages and salaries for production	10.0
R + D and technological information	21.0
administration	10.0
	41.0
Return on capital	20.0
Total costs :	100.0

Source: UNIDO, compiled from various publications.

4. INTERNATIONAL TRADE

Pharmaceuticals, drugs and intermediates have a rather important share of the total international trade. For instance, in 1973 total pharmaceutical exports were 0.9 per cent of world total exports, a position it currently maintains.

Concerning total chemical exports, pharmaceuticals represent about 10 per cent of it, although its contribution to the balance of payments of the main pharmaceutical exporting countries is very positive. This is one of the main economic reasons why several developed countries provide incentives and encouragement to the research-based pharmaceutical industry. In other countries such as Hungary and Bulgaria, pharmaceutical exports are the main component of their chemical exports.

4.1 Trade exchanges

The differing evolution between regional consumption and production patterns and intercompany competition has generated surplus or deficit balance situations, which in turn originated the trade flows and pharmaceuticals exchange patterns.

Annex 9 gives the regional exports of pharmaceuticals from 1960 to 1977.

Annex 10 shows the corresponding imports for the same period. In reading these data, it should be born in mind the clarifications given in headings 1.2 and 1.3, statistics and methodology respectively.

Annex 11 presents the main characteristics of trade exchanges by regions.

Annex 12 accounts for pharmaceutical exports flows by regions in 1975.

Annex 13 gives the corresponding import flows in 1975.

From the annexes it can be seen the dominant position of the developed countries that together account for 96 per cent of total pharmaceutical exports and 78 per cent of its imports.

From the trade flows, it is noted that the bulk of trade is carried out between developed countries regions, and particularly the intra-regional trade of Western and Eastern Europe. The developing countries play a minor role in trade except as markets. To assess the share of pharmaceutical trade in consumption, it should be compared the importance of trade weight (total exports over production) with trade exchanges related to consumption.

Annex 11 shows the trade weight by regions. However it is risky to draw general conclusions from the exchange and consumption data due to the reservations pointed out in 1.2 and 1.3, each region being a particular case.

Nevertheless, the following aspects can be pointed out.

(i) The ratio of exchanges to consumption in 1977 are 29 per cent for the developed countries and the world, followed closely by the developing countries with 25.4 per cent.

(ii) Within the developed countries the ratio is very high for Western Europe, 61.4 per cent, whilst North America and Eastern Europe have 13.1 per cent and 16.4 per cent respectively.

(iii) The high Western European ratio indicates the region's strong dependence on trade. However, as over 85 per cent is intra-regional trade, it shows an unusual interdependence among the region's country members with an inter-regional trade dependence comparable to the other two regions in (ii) above.

4.2   International markets

4.2.1 Commodity chemicals, they are chemicals sold on the basis of their specifications only. Whatever their price they will always be identified by objective specifications and not by their performance in therapy or in the drug or formulation incorporating or made from the chemical in question. Raw materials, intermediates, several common ailment drugs and most non-prescription pharmaceuticals fall within this category.

The market for any commodity chemical can be broken down according to the type of commercial channel through which it moves or the manner in which it changes hands. The most important are merchant markets in their two modalities: contract and spot markets.

For reasons explained in 2.3, and 3.2.3., pharmaceuticals are sold over-whelmingly on spot markets. Fewer arrangements exist in pseudo-merchant markets. The above illustrates the fact that the market available to a new entrant is usually a smaller fraction of actual consumption and is prey to strong competition except for patented products from single or limited sources.

4.2.2 <u>Performance chemicals</u>, they are products bought on the basis of both their specifications and the results obtained when using them. Performance pharmaceuticals are life saving and specialty products which therapeutic value is practically irreplaceable. Pharmaceutical specialties derive its performance from higly effective therapeutic effects with fewer counter indications.

From these fundamental differences between performance and commodity chemicals, it can be realized that the marketing of the former requires a far greater effort than the latter.

Thus, marketing performance pharmaceuticals require, among others, the following actions:

- frequent technical information to physicians and hospitals on indications and counter-indications of new drugs and pharmaceuticals;

- back up of technical service laboratory;

- advertising, both technical and institutional.

Because of the diversity of the types and frequency of contacts needed between manufacturer, prescriber (physician) and defrayer (health insurance agencies), it is usually very difficult to sell performance pharmaceuticals from a distance without having a suitable supporting organization close to the market able to carry out the various tasks mentioned above.

5. <u>THE FUTURE OUTLOOK TO THE YEAR 2000</u>

5.1 <u>Methodology</u>

When considering the future a distinction should be made between the future - that is, the foretelling of events at any given time - and futures - the exploring of plausible developments according to past and emerging trends, the happening of probable events, and modifications of current restrictions. The first concerns mankind and cannot be described in detail. The latter pertains to the world's economic game board for the pharmaceutical industry, that, to a large extent, influences and is influenced by the economic players or actors. Therefore it is only within the latter's approach that forecasting is made at all possible.

From the array of mechanicist, deterministic and normative methods
it was selected, for the purposes of this report, a mechanicist approach
based on the cross-section country method.

Details of the method were given in 1.3, methodology, that gave an
overview to all the methods used in this report. In summary, the forecasting
method determines by curve fitting calculations, the dominant patterns of
pharmaceutical consumption for the period 1972-76. These patterns are a
function of pharmaceutical consumption per capita in terms of GDP per capita
relationships.

Its projections to 1985, 1990 and 2000 is carried out under two independent
set of hypothesis for GDP growth while taking the UN's medium population
growth forecasts for those years. The resulting GDP per capita forecasts
were applied to the consumption patterns' function to find out the
corresponding pharmaceutical consumption value.

Figure 2 shows those patterns of pharmaceutical consumption by
regions.

In order to give sufficient judging elements to the experts reading this
report, full series of regional evolution of GDP, population and GDP/capita
between 1960 to 1977 are presented in annexes 14, 15 and 16.

The forecasted figures presented correspond only to future pharmaceutical
consumption by regions in constant US dollars of 1977.

5.2 Hypotheses to the year 2000

The attainment of the Lima Goal of 25 per cent share of world production
by developing countries in the year 2000, can be expressed by a growth
relationship between GDP, population and manufacturing value added by regions.
It presents in a very simplified form the basis of UNIDO's LIDO model to
determine regional combinations of GDP growth rates.

In order to contrast the attainment of the Lima Goal approach, it is
required a "neutral" approach based on the unhindered continuation of past
trends. Hence the selection of Leontieff's scenario X.

To ensure comparability within these two sets of GDP growth approaches,
it was selected, from the LIDO model, regional growth rates which world
aggregate is within comparable rage with Leontieff's figures.

Figure 2 - Patterns of pharmaceutical consumption by regions
(1972-76)
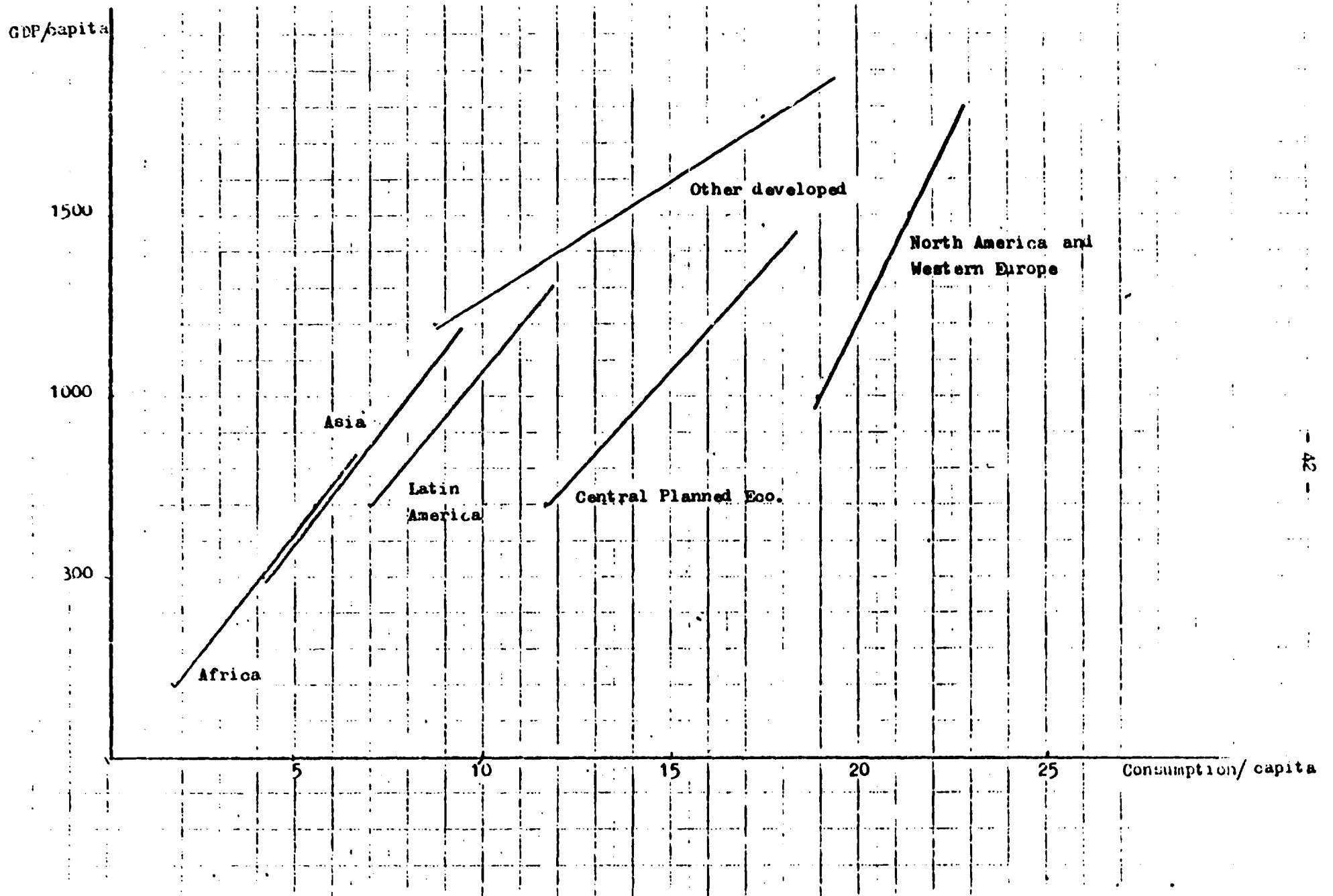
Consequently, two sets of hypotheses were defined to be used as exogenous drivers for estimating future pharmaceutical consumption by regions.

Hypothesis A is based on the LIDO model

Hypothesis B is based on Leontieff's "The Future of the World Economy" and corresponds to the passive scenario X.

Table 6 gives the corresponding GDP growth rates.

Table 6   - Regional GDP growth rates by the two main hypotheses
(average growth rates between 1977-2000)
(in per cent)

Region	Hypothesis A	Hypothesis B
Developed Countries		
North America	3.4	4.5
Western Europe	3.4	4.5
Other developed	3.4	4.5
Eastern Europe	3.4	4.5
Developing Countries		
Africa	5.2	5.9
Asia (excluding China)	5.9	5.9
Latin America	6.4	5.4

Annex 17 gives the forecasted GDP figures for the two hypotheses and population projections for the years 1985, 1990 and 2000.

5.3 Pharmaceuticals consumption outlook to the year 2000

Based on the preceding sections two pictures of pharmaceutical consumption by regions emerge. Annex 18 presents them as well as some of the main characteristics of future demand.

The following important factors emerge:

(i) Under hypothesis A, that entails the shifting of some growth dynamics to developing countries to accelerate or at least to keep their historical growth rates, developing countries may attain 26.9 per cent of the world pharmaceutical consumption by 2000.

(ii) Under hypothesis B, the continuation of past trends slows down the closing of the gap between developed and developing countries, developing countries may achieve 21.9 per cent of the world pharmaceutical consumption by 2000.

(iii) Considering the past regional production self-sufficiency given in Annex 8, developing countries attained 85 per cent self-sufficiency, that represented 11.7 per cent of the world production of pharmaceuticals.

By extrapolating these trends and assuming a 95 per cent self-sufficiency by 2000 the developing countries' share of the world pharmaceutical production would be 25.5 per cent and 20.8 per cent respectively for hypotheses A and B.

(iv) However, unless the recent years' more confrontational than cooperational attitude between developing countries and industry is superated, even those results would be in jeopardy.

Comparative morbidity patterns for the main communicable diseases
in the developing countries – maximum number of cases
(in thousands of cases)

	Africa	Asia less India	India	Latin America
1. Ancylostomiasis	88.8(63.9%/2)	n.a.	n.a.	294.9(90.6%/1)
2. Chickenpox	322.9(77.6%/9)	48.5(67.4%/4)	70.0	157.5(64.5%/4)
3. Cholera	55.6(71.6%/4)	75.6(73.0%/1)	40.9	n.a.
4. Filariasis	30.0(65.0%/1)	1(100%/3)	n.a.	1(74.0%/1)
5. Gonococcal infection	1'200.0(70.0%/5)	264.0(82.6%/3)	114.0	234.3(73.1%/6)
6. Leprosy prevalence:	287.2(62.3%/3)	249.7(67.1%/3)	1'569.0	n.a.
incidence:	13.6(64.7%/4)	20.1(68.2%/2)	141.3	12.6
7. Malaria	8'172.7(75.5%/8)	2'098.2(72.9%/3)	5'166.1	383.2(67.0%/4)
8. Measles	1'455.0(64.8%/6)	276.0(76.1%/5)	74.2	248.5(65.4%/5)
9. Mumps	143.3(64.6%/5)	85.7(63.5%/1)	n.a.	108.7(71.5%/4)
10. Other venereal diseases	n.a.	151.6(97.6%/1)	n.a.	n.a.
11. Schistosomiasis	199.9(81.7%/3)	n.a.	n.a.	n.a.
12. Syphilis	266.3(66.2%/4)	32.6(74.9%/2)	59.1	120.0(64.3%/6)
13. Tetanus	15,0(64.7%/4)	11.6	83.3	n.a.
14. Trachoma active	259.6(67.4%/3)	738.7(76.7%/2)	n.a.	n.a.
15. Tuberculosis	401.1(67.0%/1)	773.5(76.5%/5)	472.0	170.3(62.8%/4)
16. Whooping cough	378.2(75.0%/8)	132.5(65.0%/4)	195.7	150.3(81.2%/7)
17. Amoebiasis	204.1(79.0%/4)	254.6(65.5%/1)	n.a.	166.3(60.3%/1)
18. Bacillary disentery	1'100.0(63.5%/1)	418.0(81.2%/3)	n.a.	33.7(71.5%/3)
19. Diarrhoeal disease	396.0(90.4%/3)	165.2(65.3%/2)	n.a.	n.a.
20. Enterities	n.a.	154.9(95.4%/1)	n.a.	n.a.
21. Hepatitis infectious	135.1(70.7%/5)	71.2(64.8%/5)	100.9	69.0(66.8%/4)
22. Influenza	1'403.5(79.1%/3)	2'868.5(70.8%/4)	1'691.0	1'981.4(74.7%/4)
23. Intestinal parasitism	500.5(68.5%/1)	n.a.	n.a.	n.a.
24. Streptococcal sore throat	189.8(77.5%/3)	185.0(87.0%/1)	n.a.	76.3(64.0%/2)
25. Typhoid and paratyphoid	53.5(63.2%/4)	132.8(75.7%/4)	n.a.	46.6(64.6%/4)

Source: WHO Health Statistics.

Note: The figures in brackets represent the percentage of maximum disease concentration and the number of countries affected.

Annex 2   —   DISEASE PATTERNS/ U.S.A. (1976)

Disease	N° of cases
— Typhoid and paratyphoid fever	23,000
— Bacillary disentery	13,200
— Amoebiasis	3,000
— Tuberculosis	32,100
— Streptococcal sore throat	394,500
— Chickenpox	184,000
— Measles	41,200
— Hepatitis (infectious)	33,300
— Mumps	38,500
— Syphilis	71,800
— Gonococcal infections	1•002,000

Annex 3 - Simplicative patterns of morbidity by income per capita - for countries with less than US$ 100.- ... main communicable diseases (for 1970-1975)

Diseases	N° of cases (10³)	N° of countries			Population affected (10⁶) in 1975			Main countries		Incidence per 10,000
		Asia	Africa	L.America	Asia	Africa	L.America	Asia	Africa	
- Ancylostomiasis	61.2	n.a.	4	1	n.a.	12.9	4.7	-	Rwanda	66.1
- Chickenpox	261.7	4	15	-	854.2	106.0	-	India	Uganda Zaire	2.7
- Cholera	133.71	5	7	-	853.2	30.2	-	Indonesia India	-	1.5
- Filariasis	20.0	-	2	1	-	8.1	4.7	-	Central African Republic	15.6
- Gonococcal infection	1,067.1	2	14	1	740.1	91.7	4.7	India	Uganda Mali Zaire	12.7
- Leprosy prevalence	2,131.9	5	9	-	860.2	86.1	-	India	Upper Volta	22.5
incidence	154.0	4	8	-	728.1	58.2	-	Indonesia	-	1.9
- Malaria	13,083.7	6	15	1	834.9	132.8	4.7	India Indonesia	Uganda Zaire Upper Volta	134.5
- Measles	1,023.8	5	19	-	726.8	118.6	-	India	Uganda Zaire Madagascar	12.1
- Mumps	110.7	3	11	-	195.4	88.8	-	-	Sudan Zaire Uganda	3.9
- Other venereal diseases	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-
- Schistosomiasis	193.0	n.a.	6	n.a.	n.a.	32.2	n.a.	-	Sudan	6.0
- Syphilis	248.3	1	11	1	608.1	78.8	4.7	India	Sudan Madagascar	3.5
- Tetanus	95.8	4	4	-	848.9	46.2	-	India	-	1.1
- Trachoma active	433.9	1	6	-	30.1	31.6	-	Burma	-	70.3
- Tuberculosis	1,039.0	8	7	1	993.0	75.0	4.7	India	Sudan	58.0
- Whooping cough	455.1	4	3	1	755.0	75.4	4.7	India	-	5.4
- Amoebiasis	278.2	7	10	1	176.4	73.7	4.7	-	Chad Upper-Volta Mali	10.3
- Bacillary dysentery	1,225.6	6	14	-	252.8	131.4	-	Bangladesh Afghanistan	Sudan	31.9
- Diarrhoeal disease	438.5	2	4	-	7.5	12.0	-	-	Togo Chad Central African Republic	224.3
- Enteritis	2.5	1	n.a.	n.a.	15.8	-	-	Afghanistan	-	1.6
- Hepatitis infectious	189.2	5	8	-	654.3	74.4	-	India	-	42.5
- Influenza	4,114.9	7	8	1	890.0	72.0	4.7	India Indonesia	Zaire	456.3
- Intestinal parasitism	463.2	n.a.	3	n.a.	n.a.	8.0	n.a.	-	Rwanda Central African Republic	579.0
- Streptococcal sore throat	165.5	2	4	-	15.2	51.9	-	-	Upper Volta	24.6
- Typhoid and paratyphoid	120.8	6	7	1	370.9	69.5	4.7	Pakistan	Sudan Zaire	2.7

Average: 68.1

Source: WHO Health Statistics.

Note: 1/ Haiti is the only Latin American country in this category.

Annex 4 — Consumption of pharmaceuticals at ex-manufacturers'/ CIF import current prices (Millions of US dollars)

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978 (est.)
Regions											
Developed Countries											
− Market Eco.											
• North America	3,824	5,024	7,747	8,208	9,047	9,754	10,254	11,177	12,128	13,318	14,565
• Western Europe	2,302	3,731	6,827	7,839	8,802	10,649	12,287	13,990	15,020	16,454	19,745
• Other developed	522	1,077	2,785	3,117	4,453	6,131	7,165	7,458	8,922	9,627	10,460
− Centrally Planned Eco.											
• Eastern Europe	NA	NA	5,295	6,017	6,829	7,750	8,700	9,767	10,812	12,029	13,117
Total Developed Countries	8,676[a]	12,831[a]	22,654	25,181	29,131	34,284	38,406	42,392	46,882	51,428	57,887
Developing Countries											
• Africa	NA	NA	467	507	533	602	686	786	895	994	1,123
• Asia (excluding China)	NA	NA	1,257	1,467	1,711	1,965	2,252	2,818	3,364	4,101	4,921
• Latin America	NA	NA	1,335	1,608	1,961	2,474	3,040	3,232	3,188	3,571	3,976
Total Developing Countries	—	—	3,059	3,582	4,205	5,041	5,978	6,836	7,447	8,666	10,020
World Total	9,848[a]	14,564[a]	25,713	28,763	33,336	39,325	44,384	49,228	54,329	60,094	67,907

Source: UNIDO, calculated from various sources and IFPMA data.

Note: [a] estimates based on the growth rate of the developed countries of market economies' regions.

Annex 5 -   Main characteristics of the demand for pharmaceuticals by regions

Regions	Average Growth Rate			Consumption level US$/per Capita			Share		
	60-70 %	70-75 %	75-78 %	1970 %	1975 %	1977 %	1970 %	1975 %	1978 %
Developed Countries									
- Market Economies									
North America	7.3	7.6	9.2	33.8	46.7	54.7	30.1	22.7	21.4
Western Europe	11.5	15.4	12.2	20.5	40.7	47.6	26.6	28.4	29.1
Other developed	18.2	21.8	11.9	19.2	46.8	50.8	10.8	15.2	15.4
- Centrally Planned Economies									
Eastern Europe	NA	13.0	10.3	14.5	25.6	· 31.0	20.6	19.8	19.3
Total developed	10.1	13.3	10.9	21.1	37.8	45.1	88.1	86.1	85.2
Developing Countries									
Africa	NA	11.0	12.6	1.4	2.1	2.5	1.8	1.6	1.6
Asia (excluding China)	NA	17.5	20.4	1.3	2.3	3.2	4.9	5.7	7.2
Latin America	NA	19.3	7.1	5.1	10.7	11.2	5.2	6.6	5.8
Total developing	NA	17.4	13.6	2.0	3.6	4.4	11.9	13.9	14.8
World total	10.1	13.9	11.3	9.8	16.3	19.2	100.0	100.0	100.0

Source: calculated based on Annex

Ethical Pharmaceuticals Domestic Sales at Current Ex-manufacturers Prices (in Millions of Current US Dollars)

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Western Europe												
Austria	40.5	61.3	116.7	129.0	142.4	158.7	182.9	195.0	211.8			
Belgium	35.5	62.9	99.4	114.1	130.6	168.3	196.4	239.3	254.0	282.7		
Finland	39.6	64.3	101.3	101.7	117.5	130.5	150.6	161.7	170.3	199.0		
France	453.8	736.4	1,462.2	1,601.2	1,780.5	1,952.9	2,247.0	2,410.6	2,646.0			
Germany/F.R.	-	559.0	1,155.1	1,308.1	1,694.3	2,303.9	2,659.0	3,111.5	3,242.4			
Holland	62.8	108.8	217.4	360.6	380.8	407.9	551.2	660.1	683.7	716.7		
Norway	22.0	34.6	64.5	70.8	51.6	116.8	139.6	173.0	188.0	213.2		
Spain	159.3	331.4	602.5	743.2	823.5	933.1	1,018.7	1,190.7	1,285.0			
Switzerland	-	112.6	208.0	261.0	295.0	366.0	410.0	514.0	512.0			
United Kingdom	399.0	586.0	695.0	821.0	845.0	999.0	1,139.0	1,379.0	1,390.0	1,610.0		
Sub-Total Western Europe	-	2,657.4	4,862.1	5,582.7	6,289.2	7,617.1	8,755.2	10,052.9	10,633.2			
North America												
Canada	-	-	305.2	352.2	400.0	405.0	491.4	509.1	552.6	660.5		
USA	1,057.0	4,805.0	7,409.0	7,821.0	8,620.0	9,300.0	9,695.0	10,582.0	11,472.0	12,212.0		
Total N. America	-	-	7,714.2	8,173.2	9,080.0	9,705.0	10,186.4	11,091.1	12,034.6	13,104.5		
Other developed countries of Western Hemisphere [1]												
Australia	-	120.4	195.1	223.0	253.9	306.0	354.0	392.5	300.3	393.5		
Japan	480.3	907.5	2,348.3	2,627.0	3,734.9	5,258.4	6,102.3	6,333.3	7,630.8	8,224.0		
Latin America												
Brazil	-	-	-	-	514.8	750.2	894.1	1,120.1	1,260.2	1,361.7	1,410.3	
Colombia	43.1	60.6	80.7	86.5	96.5	116.9	139.9	161.8	178.7	200.0		
Asia												
India	91.8	194.0	330.0	401.7	477.5	496.4	523.1	716.9	895.1	1,101.4		
Philippines	55.1	73.4	80.7	99.4	96.7	123.2	170.8	182.0	204.0	230.0		
Rep. of Korea	5.1	14.7	67.9	82.9	97.1	146.3	214.1	302.8	417.6	515.4		
Turkey	-	-	120.5	131.9	151.4	194.9	216.4	302.4	311.7	342.6		

Notes: 1) The statistics include figures for absolute hospital sales and are priced at wholesaler's prices to pharmacies.

Source: IFPMA based on figures provided by some of its 47 country member pharmaceutical manufacturers associations

Years Regions	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978 (est.)
Developed Countries											
– Market Eco.											
• North America	4,025	5,288	8,155	8,640	9,523	10,382	11,044	12,027	13,104	14,369	15,878
• Western Europe	2,828	4,630	8,472	9,728	10,923	13,445	15,835	17,862	19,100	21,196	25,435
• Other developed	565	1,113	2,731	3,062	4,305	5,956	6,929	7,174	8,583	9,247	10,003
– Centrally Planned Eco.											
• Eastern Europe	NA	NA	5,614	6,380	7,241	8,318	9,322	10,271	11,247	12,331	13,443
Total Developed Countries	9,563[a]	14,143[a]	24,972	27,810	31,992	38,101	43,130	47,334	52,034	57,143	64,759
Developing Countries											
• Africa	NA	NA	130	157	176	199	226	264	310	364	416
• Asia (excluding China)	NA	NA	1,075	1,255	1,460	1,706	2,002	2,485	2,973	3,621	4,345
• Latin America	NA	NA	1,140	1,430	1,782	2,294	2,858	3,063	3,039	3,397	3,786
Total Developing Countries	—	––	2,361	2,842	3,418	4,199	5,086	5,812	6,330	7,382	8,547
World Total	10,625[a]	15,654[a]	27,333	30,652	35,410	42,300	48,216	53,146	58,364	64,525	73,306

Source: UNIDO, calculated from the consumption and trade figures, annexes

Note: [a] estimates

Annex 8 - __Main characteristics of the production of pharmaceuticals by regions__

Regions	Average Growth Rate			Share			Production Self Suficiency [1]		
	60-70 %	70-75 %	75-78 %	1970 %	1975 %	1978 %	1970 %	1975 %	1978 %
__Developed Countries__									
- __Market Economies__									
North America	7.3	8.1	9.7	29.9	22.6	21.6	105.3	107.6	109.0
Western Europe	11.6	16.1	12.5	31.0	33.6	34.7	124.1	127.6	128.8
Other developed	17.1	21.3	11.7	10.0	13.5	13.6	90.1	96.2	95.6
- __Centrally Planned Economies__									
Eastern Europe	NA	12.8	9.4	20.5	19.3	18.3	106.0	105.2	102.5
__Total developed__	10.1	13.6	11.0	91.4	89.0	88.3	110.2	111.6	111.8
__Developing Countries__									
Africa	NA	13.8	16.3	0.5	0.5	0.6	29.5	33.6	47.0
Asia (excluding China)	NA	18.2	20.5	3.9	4.7	5.9	85.5	88.2	88.3
Latin America	NA	21.7	7.3	4.2	5.8	5.2	86.0	94.8	95.2
__Total Developing__	NA	19.7	13.7	8.6	11.0	11.7	77.2	85.0	85.3
__World Total__	9.9	14.2	11.3	100.0	100.0	100.0			

__Source:__ calculated based on Annex

__Note:__ [1] Production over consumption.

Annex 9 — Exports of Pharmaceuticals at Current FOB Prices (Millions of US dollars)

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978
Regions											
Developed Countries											
— Market Eco.											
• North America	286	276	459	434	515	677	857	936	1,071	1,185	
• Western Europe	614	875	1,791	2,126	2,614	3,490	4,366	4,809	5,242	6,120	
• Other developed	31	67	104	135	172	233	290	253	298	353	
— Centrally Planned Eco.											
• Eastern Europe	53	162	359	422	531	606	709	834	792	874	
Total Developed Countries	984	1,380	2,713	3,117	3,832	5,006	6,222	6,912	7,403	8,532	
Developing Countries											
• Africa	NA	NA	NA	NA	NA	NA	NA	NA	25	35	
• Asia (excluding China)	NA	18	51	62	60	85	125	133	148	165	
• Latin America	NA	31	57	66	65	91	125	135	141	140	
Total Developing Countries	—	49	108	128	125	176	250	268	314	340	
World Total	984[a]	1,429	2,821	3,245	3,957	5,182	6,472	7,180	7,717	8,872	

Source: UNIDO, based on the UN International Trade Statistics, UN Annual Review of the Chemical Industry, IFPMA and other sources.

Note: [a] estimate

Imports of Pharmaceuticals at Current CIF Prices (Millions of US dollars)

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978
Regions											
Developed Countries											
– Market Eco.											
• North America	63	99	166	202	244	19	357	410	445	558	
• Western Europe	294	531	1,235	1,388	1,805	2,352	2,841	3,180	3,511	3,935	
• Other developed	53	130	356	384	441	577	709	708	623	918	
– Centrally Planned Eco.											
• Eastern Europe	105	215	403	459	536	639	768	890	956	1,101	
Total Developed Countries	515	975	2,160	2,433	3,026	3,847	4,675	5,188	5,735	6,562	
Developing Countries											
• Africa	NA	NA	NA	NA	392	443	505	575	661	731	
• Asia (excluding China)	NA	NA	NA	NA	223	262	307	368	436	550	
• Latin America	NA	NA	NA	NA	309	397	492	527	522	587	
Total Developing Countries	—	—	—	—	924	1,102	1,304	1,470	1,619	1,868	
World Total	940[a]	1,365[a]	2,694[a]	3,099[a]	3,950	4,949	5,979	6,698	7,354	8,430	

Source: UNIDO, based on the UN International Trade Statistics, UN Annual Review of the Chemical Industry, IFPMA an other sources.

Note: a) estimates based on the developed countries' imports and total exports growth rates.

Main characteristics of trade exchange of pharmaceuticals by regions

Regions	1972			1977			Trade Weight Export/production			Growth Rate	
	Export	Import	Balance	Export	Import	Balance	1972	1975	1977	Export 1972-77	Import 1972-77
Developed Countries											
- Market Economies											
North America	515	244	+ 271	1,185	558	+ 597	5.4	7.8	8.2	18.1	19.2
Western Europe	2,614	1,805	+ 809	6,120	3,985	+ 2,135	23.9	27.4	28.9	18.5	17.2
Other developed	172	441	- 269	353	918	- 565	4.0	3.5	3.8	15.5	15.8
- Centrally Planned Economies											
Eastern Europe	531	536	- 5	874	1,101	- 227	7.3	8.1	7.1	10.9	15.5
Total developed	3,832	3,026	+ 806	8,532	6,562	+ 1,970	12.0	14.6	14.9	17.4	16.7
Developing Countries											
Africa	NA	392	—	35	731	- 696	—	—	9.6	--	13.3
Asia (excluding China)	60	223	- 163	165	550	- 385	4.1	5.3	4.6	22.4	19.8
Latin America	65	309	- 244	140	587	- 447	3.6	4.4	4.1	16.6	13.7
Total developing	125	924	- 799	40	1,868	- 1,528	3.6	4.6	4.6	22.2	15.1
World Total	3,957	3,950	+ 7	8,872	8,430	+ 442	11.2	13.5	13.7	17.5	16.4

Source: UNIDO

Annex 12 - Pharmaceuticals export flows in 1975.

(percentage)

From \ To	North American developed countries	Western European countries	Southern European countries	Other developed countries	Centrally planned economies	Latin America	Africa	Asia	Total
North American developed countries	9.8	26.7	11.7	17.3	0.5	18.7	3.0	12.3	100.0
Western European countries	4.1	49.6	9.8	6.9	1.8	6.5	11.0	10.3	100.0
Southern European countries	7.9	40.3	6.7	4.4	9.4	9.3	8.2	13.8	100.0
Other developed countries	14.5	25.8	3.6	15.1	1.0	6.1	3.0	30.9	100.0
Centrally planned economies	0.7	4.9	1.6	0.6	92.2	n.a.	n.a.	n.a.	100.0
Latin America	33.3	36.2	18.2	12.3	–	n.a.	n.a.	n.a.	100.0
Africa	–	10.0	90.0	–	–	n.a.	n.a.	n.a.	100.0
Asia	8.5	26.3	4.9	60.3	–	n.a.	n.a.	n.a.	100.0

Annex 13 – <u>Pharmaceuticals import flows in 1975</u>

(percentage)

From \ To	North American developed countries	Western European countries	Southern European countries	Other developed countries	Centrally planned economies	Latin America	Africa	Asia
North American developed countries	22.7	8.1	16.4	26.1	0.6	31.4	4.4	15.3
Western European countries	50.6	80.0	72.7	54.8	12.4	57.9	87.6	67.8
Southern European countries	10.3	6.9	5.3	3.8	6.7	8.8	7.0	9.7
Other developed countries	6.2	1.5	1.0	4.2	0.2	1.9	1.0	7.2
Centrally planned economies	1.1	1.0	1.5	0.7	80.1	n.a.	n.a.	n.a.
Latin America	7.2	1.0	2.4	1.7	n.a.	n.a.	n.a.	n.a.
Africa	-	0.7	-	-	n.a.	n.a.	n.a.	n.a.
Asia	1.9	0.8	0.7	8.7	n.a.	n.a.	n.a.	n.a.
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: UN-Yearbook of International Trade Statistics 1977
UN Supplement of the World Trade Annual, 5 vol., 1975
OECD Trade by Commodities, 2 vol., 1975

Annex 14 - <u>Evolution of GNP by Regions at current prices</u> (10^6 US dollars)

Regions	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977 (est.)
<u>Developed Countries</u>										
– <u>Market Economies</u>										
• North America	548,473	742,150	1,068,687	1,161,867	1,282,324	1,434,400	1,566,844	1,699,273	1,906,346	2,097,637
• Western Europe	324,270	512,855	761,038	866,634	1,033,415	1,307,378	1,456,860	1,701,208	1,762,552	1,991,790
• Other Developed	72,486	131,981	263,460	303,028	381,243	529,447	602,613	646,794	716,076	857,587
– <u>Centrally Planned Eco.</u>										
• Eastern Europe	154,362	263,884	478,588	529,180	586,271	677,995	724,384	762,215	874,337	988,001
<u>Total Developed</u>	1,099,591	1,650,870	2,571,773	2,865,709	3,283,253	3,949,220	4,350,721	4,809,490	5,259,311	5,935,015
<u>Developing Countries</u>										
• Africa	27,034	39,635	57,205	63,874	73,002	91,233	122,961	136,130	148,747	187,421
• Asia [1]	82,270	119,521	156,737	168,402	188,006	248,132	351,281	383,208	432,942	606,119
• Latin America	65,558	91,417	150,682	166,277	180,931	229,287	296,751	340,915	369,785	380,879
<u>Total Developing</u>	174,862	250,573	364,624	398,553	442,019	568,652	770,993	860,341	951,474	1,174,499
<u>World Total</u>	1,274,453	1,901,443	2,936,397	3,264,262	3,725,272	4,517,872	5,121,714	5,669,831	6,210,785	7,109,514

<u>Source:</u> UN National Accounts for 126 countries.

<u>Note:</u> 1) excluding China.

Table 15 - Evolution of the Population by Regions (10^3)

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	197
Developed Countries										
− Market Economies										
* North America	200,955	216,821	228,920	231,420	233,540	235,430	237,330	239,390	241,570	243,4
* Western Europe	301,783	320,298	333,230	335,560	337,880	340,020	341,770	343,260	344,280	345,3
* Other developed	123,957	132,415	145,100	147,590	150,030	152,640	157,370	159,440	161,590	163,6
− Centrally Planned Eco.										
* Eastern Europe	328,577	349,138	366,130	369,280	372,440	375,510	378,710	381,920	385,060	388,3
Total Developed	955,272	1,018,672	1,073,380	1,083,850	1,093,890	1,103,600	1,112,900	1,121,940	1,130,350	1,138,6
Developing Countries										
* Africa	226,165	254,829	330,985	337,180	342,480	355,580	365,770	375,920	385,280	400,
* Asia [1]	831,459	941,321	969,150	1,102,710	1,129,320	1,156,640	1,183,410	1 213,230	1,240,560	1,266,0
* Latin America	198,228	231,583	263,270	279,630	278,010	285,710	293,380	301,550	310,110	318,8
Total Developing	1,255,852	1,427,733	1,563,405	1,719,520	1,749,810	1,797,930	1,842,560	1,890,700	1,935,950	1,985,
World Total	2,211,124	2,446,405	2,636,785	2,803,370	2,843,700	2,901,530	2,955,460	3,012,640	3,067,300	3,123,

Source: UN, Statistical Yearbook for 125 countries

Note: [1] excluding China

Years	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977
Regions										
Developed Countries										
– Market Economies										
▪ North America	2,729	3,420	4,667	5,030	5,480	6,103	6,611	7,109	7,845	8,562
▪ Western Europe	1,073	1,602	2,285	2,587	3,057	3,845	4,260	4,960	5,124	5,773
▪ Other developed	564	583	1,994	1,280	1,597	2,202	2,486	2,649	2,917	3,529
– Centrally Planned Eco.										
▪ Eastern Europe	469	756	1,307	1,434	1,576	1,807	1,911	1,995	2,271	2,546
Total Developed Countries	1,150	1,619	2,397	2,639	3,001	3,579	3,911	4,286	4,655	5,229
Developing Countries										
▪ Africa	120	155	173	190	213	256	336	362	385	468
▪ Asia [1]	99	127	161	153	166	214	296	315	349	478
▪ Latin America	331	395	572	594	650	802	1,012	1,133	1,193	1,194
Total Developing Countries	139	176	233	232	253	316	419	455	491	592
World Total	576	776	1,112	1,161	1,308	1,555	1,730	1,800	2,022	2,278

Sources: UN National Accounts and UN Statistical Yearbook for 125 Countries.   Note: [1] excluding China

| Regions | GDP (in million US dollars of 1977) | | | | | | Population (in million) | | |
| | Hypothesis A | | | Hypothesis B | | | | | |
	1985	1990	2000	1985	1990	2000	1985	1990	2000
Developed Countries									
Market Economies									
North America	2,740,909	3,239,644	4,525,876	2,983,051	3,717,424	5,773,046	264,435	277,924	307,001
Western Europe	2,602,602	3,076,171	4,297,500	2,832,525	3,529,842	5,481,737	360,814	369,925	388,843
Other developed	1,120,579	1,324,479	1,850,335	1,219,575	1,519,812	2,360,222	185,036	199,337	231,339
Centrally Planned Economies									
Eastern Europe	1,290,986	1,525,894	2,131,718	1,405,037	1,750,931	2,719,143	405 464	417,775	443,529
Total developed	7,755,077	9,166,188	12,805,431	8,440,188	10,518,009	16,334,148	1,216,749	1,264,961	1,370,712
Developing Countries									
Africa	281,154	362,262	601,423	296,473	394,880	700,527	476,535	536,531	680,131
Asia (excluding China)	958,794	1,277,042	2,655,505	958,794	1,277,042	2,265,505	1,662,417	1,945,581	2,666,463
Latin America	625,633	853,155	1,586,516	580,112	754,597	1,276,794	413,196	483,676	662,753
Total developing	1,865,581	2,492,459	4,453,444	1,835,379	2,426,519	4,242,826	2,552,148	2,966,188	4,009,350
World Total	9,620,658	11,658,647	17,258,875	10,275,567	12,944,528	20,576,974	3,768,897	4,231,149	5,380,052

Source: UNIDO, population figures taken from UN "World Population Prospects as assessed in 1973".

Table III - Forecast of the demand for pharmaceuticals by regions

Regions	Hypothesis A							Hypothesis B						
	Consumption of Pharmaceuticals (million US dollars of 1977)			Average Growth rate (%)	Market share (%)			Consumption of Pharmaceuticals (million US dollars of 1977)			Average Growth rate (%)	Market share (%)		
	1985	1990	2000	1977-2000	1985	1990	2000	1985	1990	2000	1977-2000	1985	1990	2000
Developed Countries														
Market Eco.														
North America	16,623	19,394	25,938	2.9	21.2	20.5	19.0	17,976	22,339	31,891	3.9	21.2	21.5	20.0
Western Europe	17,510	19,920	26,014	2.7	22.1	21.1	19.1	18,625	22,077	31,644	3.6	22.0	21.2	19.9
Other developed	15,574	18,592	26,458	3.6	19.6	19.7	19.4	18,041	21,620	34,377	4.4	22.3	20.8	21.6
Centrally Planned Eco.														
Eastern Europe	13,619	15,754	21,214	2.9	17.2	16.7	15.6	14,637	17,714	26,345	4.0	17.2	17.0	16.6
Total developed	63,526	73,660	99,624	3.0	80.1	78.0	73.1	69,279	83,750	124,257	4.0	81.7	80.5	78.1
Developing Countries														
Africa	2,292	2,924	4,750	5.0	2.9	3.1	3.5	2,406	3,176	5,523	5.7	2.8	3.0	3.5
Asia (excluding China)	7,896	10,314	18,212	5.7	9.9	10.9	13.4	7,896	10,314	18,212	5.7	9.3	10.0	11.4
Latin America	5,595	7,521	13,679	6.1	7.1	8.0	10.0	5,227	6,723	11,174	5.2	6.2	6.5	7.0
Total developing	15,783	20,759	36,641	5.8	19.9	22.0	26.9	15,529	20,213	34,909	5.5	18.3	19.5	21.9
World total	79,309	94,419	136,265	3.7	100.0	100.0	100.0	84,808	103,963	159,166	4.3	100.0	100.0	100.0

Source: UNIDO.