

CLINICAL LABORATORY REAGENTS

MARKET SURVEY

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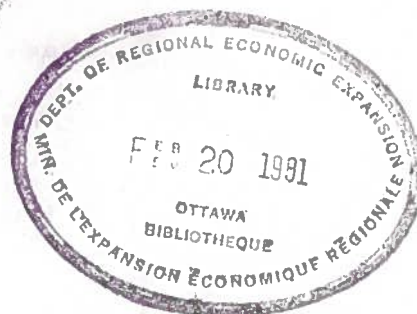
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Galasco Consultants Ltd  
Ltée

CLINICAL LABORATORY REAGENTS  
MARKET SURVEY

A MARKET SURVEY  
PREPARED FOR:  
DEPARTMENT OF REGIONAL ECONOMIC  
EXPANSION

800 Place Victoria  
Montreal, Quebec



FINAL REPORT  
JULY 2, 1980  
MONTREAL, QUEBEC  
PROJECT NUMBER 132

# Galasco Consultants <sup>Ltd</sup> Ltée

July 3rd, 1980

Mr. A. Gamache,  
Ministry of Regional Economic Expansion,  
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RE: Clinical Laboratory Reagents  
Project No. 132

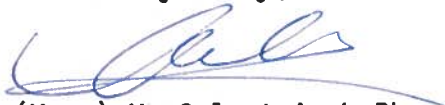
Dear Mr. Gamache,

According to our mandate (our proposal no. 322), we are pleased to submit twelve (12) copies of the final report of the Clinical Laboratory Reagents Market Survey.

The draft report dated May 16th, 1980 has been revised in accordance with the comments expressed by your group during our presentation of the draft report June 23rd, 1980 and additional research conducted by us to clarify certain issues and substantiate the findings.

We are pleased to have served the Department of Regional Economic Expansion in the preparation of this report and appreciate the co-operation and assistance of the department's personnel in helping us execute this study.

Yours very truly,

  
(Mrs.) M. Galantai, L Ph,  
Vice-President

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enc.

TABLE OF CONTENTS

	<u>Page</u>
1.0 GENERAL	
1.1. Introduction	1-1
1.2. Objectives of the Survey	1-1
1.3 Survey Methodology	1-2
1.4 Acknowledgements	1-5
2.0 EXECUTIVE SUMMARY (English and French)	2-1
2.1. Current Canadian Market	2-1
2.2. Market Environment	2-2
2.3. Demand Projection	2-2
2.4. Manufacturing Opportunities	2-2
3.0 QUANTITATIVE AND QUALITATIVE RESEARCH	3-1
3.1. General	3-1
3.1.1. Bacteriology	3-1
3.1.2. Biochemistry	3-2
3.1.3. Blood Bank	3-2
3.1.4. Blood Coagulation	3-3
3.1.5. Hematology	3-3
3.1.6. Immunology	3-3
3.1.7. RA & RIA	3-4
3.1.8. Serology	3-4
3.1.9. Urinalysis	3-5
3.1.10 Virology	3-5
3.2. Bacteriology	3-7
3.2.1. General	3-7
3.2.2. Total Current (1980) Canadian Market	3-7
3.2.3. Regional Break-down	3-8
3.2.4. Leading Manufacturers	3-8
3.2.5. Importance of Factors in Brand Selection	3-9
3.2.6. Market Trend Estimated by End User	3-11
3.2.7. Desirability of Canadian-made Products by End Users	3-12
3.2.8. Improvements Needed	3-13

3.3. Biochemistry	
3.3.1. General	3-15
3.3.2. Total Current (1980) Canadian Market	3-16
3.3.3. Regional Break-down	3-17
3.3.5. Leading Manufacturers	3-18
3.3.5. Importance of Factors in Brand Selection	3-18
3.3.6. Market Trend Estimated by End User	3-19
3.3.7. Desirability of Canadian-made Products by End Users	3-20
3.3.8. Improvements Needed	3-21
3.4. Blood Bank	3-22
3.4.1. General	3-22
3.4.2. Total Current (1980) Canadian Market	3-22
3.4.3. Regional Break-down	3-23
3.4.4. Leading Manufacturers	3-23
3.4.5. Importance of Factors in Brand Selection	3-24
3.4.6. Market Estimated by End User	3-26
3.4.7. Desirability of Canadian-made Products by End Users	3-27
3.4.8. Improvements Needed	3-28
3.5. Blood Coagulation	3-29
3.5.1. General	3-29
3.5.2. Total Current (1980) Canadian Market	3-29
3.5.3. Regional Break-down	3-30
3.5.4. Leading Manufacturers	3-30
3.5.5. Importance of Factors in Brand Selection	3-31
3.5.6. Market Trend Estimated by End User	3-32
3.5.7. Desirability of Canadian-made Products by End User	3-33
3.5.8. Improvements Needed	3-35
3.6. Hematology	3-36
3.6.1. General	3-36
3.6.2. Total Current (1980) Canadian Market	3-36
3.6.3. Regional Break-down	3-37
3.6.4. Leading Manufacturers	3-37
3.6.5. Importance of Factors in Brand Selection	3-38
3.6.7. Market Trend Estimated by End User	3-40
3.6.7. Desirability of Canadian-made Products by End User	3-41
3.6.8. Improvements Needed	3-42
3.7. Immunology	3-43
3.7.1. General	3-43

Page

3.7.2. Total Current (1980) Canadian Market	3-43
3.7.3. Regional Break-down	3-44
3.7.4. Leading Manufacturers	3-44
3.7.5. Importance of Factors in Brand Selection	3-45
3.7.6. Market Trend Estimated by End User	3-47
3.7.7. Desirability of Canadian-made Products by End Users	3-48
3.7.8. Improvements Needed	3-49
3.8. Radio-immunoassay	3-50
3.8.1. General	3-50
3.8.2. Total Current (1980) Canadian Market	3-50
3.8.3. Regional Break-down	3-51
3.8.4. Leading Manufacturers	3-52
3.8.5. Importance of Factors in Brand Selection	3-53
3.8.6. Market Trend Estimated by End User	3-54
3.8.7. Desirability of Canadian-made Products by End Users	3-56
3.8.8. Improvements Needed	3-57
3.9. Serology	3-58
3.9.1. General	3-58
3.9.2. Total Current (1980) Canadian Market	3-58
3.9.4. Leading Manufactuerrs	3-59
3.9.5. Importance of Factors in Brand Selection	3-60
3.9.6. Market Trend Estimated by End User	3-62
3.9.7. Desirability of Canadian-made Products by End Users	3-63
3.9.8. Improvements Needed	3-64
3.10. Urinalysis	3-65
3.10.1. General	3-65
3.10.2. Total Current (1980) Canadian Market	3-65
3.10.3. Regional Break-down	3-65
3.10.4. Leading Manufacturers	3-66
3.10.5. Importance of Factors in Brand Selection	3-67
3.10.6. Market Trend Estimated by End User	3-68
3.10.7. Desirability of Canadian-made Products by End Users	3-70
3.10.8. Improvements Needed	3-71
3.11. Virology	3-72
3.11.1 General	3-72
3.11.2. Total Current (1980) Canadian Market	3-72

3.11.3. Regional Break-down	3-73
3.11.4. Leading Manufacturers	3-73
3.11.5. Importance of Factors in Brand Selection	3-74
3.11.6. Market Trend Estimated by End User	3-76
3.11.7. Desirability of Canadian-made Products by End User	3-77
3.11.8. Improvements Needed	3-78
3.12. Analysis and Conclusions	3-78
4.0. ACTUAL CANADIAN CLIMATE OF COMPETITION AND PROSPECTS	4-1
4.1. The Laboratory Reagent Industry in Canada	4-1
4.2. Climate of Competition Viewed by Manufacturers	4-2
4.3. The Role of Environmental Factors in the Diagnostic Industry	4-6
4.4. Manufacturing Opportunities in Canada	4-7
4.4.1. Identification of Approach	4-7
4.4.2. The Major Companies	4-7
4.4.3. Summary of Problems Encountered by Canadian Firms	4-8
4.4.4. Summary of Problems Encountered by Multinational Firms	4-9
4.4.5. Could a Canadian Industry be Created?	4-9
4.4.6. How Canadian Manufacturing Can be Promoted	4-9
5.0. DEMAND PROJECTION	5-1
5.1. General	5-1
5.1.1. Factors Influencing Demand	5-1
5.1.2. Methods of Projecting Demand	5-1
5.2. Projection of Demand Based on Health Care Expenditure	5-2
5.2.1. General	5-2
5.2.2. Historical Trends	5-2
5.2.3. Projection of Future Trends	5-5
5.2.3.1. General	5-5
5.2.3.2. Expected Demographic Changes	5-5
5.2.3.2.1. Life Expectancy at Birth	5-5
5.2.3.2.2. Total Fertility Rate	5-6
5.2.3.2.3. Internal Migration	5-7
5.2.3.3. Demographic Scenarios Selected for the Projections	5-7
5.2.3.4. The Importance of Aging	5-8
5.2.3.5. The Basis of Projections of Health Expenditures	5-9
5.2.3.5.1. Demographic Changes and Consumption of Health Services	5-9

5.2.3.5.2. Assumptions	5-10
5.2.3.6. Projections of Government-insured Health Expenditures	5-11
5.2.3.7. Impact of Parameters on Base Cases	5-15
5.2.3.7.1. Impact of Alternative Demographic Scenarios	5-16
5.2.3.7.2. Impact of Changes in Consumption Patterns	5-16
5.2.3.7.3. Impact of Changes in Relative Prices	5-16
5.2.4. Conclusion	5-17
5.2.5. Projection of Demand Based on Health Care Expenditures	5-19
5.2.6. Projection of Demand Based on End Users' Estimates	5-28
5.2.7. Projection of Demand Based on Consultant's Estimate	5-28



LIST OF TABLES

<u>Section</u>	<u>Table</u>	<u>Page</u>
3.2. Bacteriology	3.1. Estimated Total Bacteriology Market	3-7
	3.2. Bacteriology Market by Region	3-8
	3.3. Market Shares of Leading Manufacturers	3-9
	3.4. Importance of Factors in Brand Selection - Frequency Distribution	3-10
	3.5. Importance of Factors in Brand Selection - Weighted Rankings	3-11
	3.6. Market Trend Estimated by End User	3-12
3.3. Biochemistry	3.7. Estimated Total Biochemistry Market	3-14
	3.8. Biochemistry Market by Region	3-14
	3.9. Market Shares of Leading Manufacturers	3-16
	3.10 Importance of Factors in Brand Selection - Frequency Distribution	3-17
	3.11 Importance of Factors in Brand Selection - Weighted Rankings	3-18
	3.12 Market Trend Estimated by End User	3-19
3.4. Blood Bank	3.13 Estimated Total Blood Bank Market	3-22
	3.14 Blood Bank Market by Region	3-23
	3.15 Market Shares of Leading Manufacturers	3-24
	3.16 Importance of Factors in Brand Selection - Frequency Distribution	3-25
	3.17 Importance of Factors in Brand Selection - Weighted Rankings	3-25
	3.18 Market Trend Estimated by End User	3-26
3.5. Blood Coagulation	3.19 Estimated Total Blood Coagulation Market	3-29
	3.20 Blood Coagulation Market by Region	3-30
	3.21 Market Shares of Leading Manufacturers	3-30
	3.22 Importance of Factors in Brand Selection - Frequency Distribution	3-31
	3.23 Importance of Factors in Brand Selection - Weighted Rankings	3-32
	3.24 Market Trend Estimated by End User	3-33
3.6. Hematology	3.25 Estimated Total Hematology Market	3-36
	3.26 Hematology Market by Region	3-37
	3.27 Market Shares of Leading Manufacturers	3-38
	3.28 Importance of Factors in Brand Selection - Frequency Distribution	3-39

<u>Section</u>	<u>Table</u>	<u>Page</u>
	3.29. Importance of Factors in Brand Selection - Weighted Rankings	3-39
	3.30. Market Trend Estimated by End User	3-40
3.7. Immunology	3.31. Estimated Total Immunology Market	3-43
	3.32. Immunology Market by Region	3-44
	3.33. Market Shares of Leading Manufacturers	3-45
	3.34. Importance of Factors in Brand Selection - Frequency Distribution	3-46
	3.35. Importance of Factors in Brand Selection - Weighted Rankings	3-46
	3.36. Market Trend Estimated by End User	3-47
3.8. RA & RIA	3.37. Estimated Total RIA Market	3-51
	3.38. RIA Market by Region	3-51
	3.39. Market Shares of Leading Manufacturers	3-52
	3.40. Importance of Factors in Brand Selection - Frequency Distribution	3-53
	3.41. Importance of Factors in Brand Selection Weighted Rankings	3-54
	3.42. Market Trend Estimated by End User	3-55
3.9. Serology	3.43. Estimated Total Serology Market	3-58
	3.44. Serology Market by Region	3-59
	3.45. Market Shares of Leading Manufacturers	3-60
	3.46. Importance of Factors in Brand Selection - Frequency Distribution	3-61
	3.47. Importance of Factors in Brand Selection - Weighted Rankings	3-61
	3.48. Market Trend Estimated by End User	3-62
3.10. Urinalysis	3.49. Estimated Total Urinalysis Market	3-65
	3.50. Urinalysis Market by Region	3-66
	3.51. Market Shares of Leading Manufacturers	3-66
	3.52. Importance of Factors in Brand Selection - Frequency Distribution	3-67
	3.53. Importance of Factors in Brand Selection - Weighted Rankings	3-68
	3.54. Market Trend Estimated by End User	3-69
3.11. Virology	3.55. Estimated Total Virology Market	3-72
	3.56. Virology Market by Region	3-73

<u>Table</u>	<u>Page</u>
3.57. Market Shares of Leading Manufacturers	3-74
3.58. Importance of Factors in Brand Selection - Frequency Distribution	3-75
3.59. Importance of Factors in Brand Selection - Weighted Rankings	3-75
3.60. Market Trend Estimated by End User	3-76
5.1. Health Care Expenditure by Category as a Percentage of GNP	5-3
5.2. Governments' Health Expenditure in Millions of Dollars and as a Percentage of Budget	5-4
5.3. Sources of Funds for Total Health Expenditures	5-4
5.4. Life Expectancy at Birth, Actual and Projected	5-6
5.5. Total Fertility Rate, Actual and Projected	5-7
5.6. Percentage Growth Rate of Canadian Population by Age Group, 10 Year Periods	5-8
5.7. Percentage of Population Aged 65 Years and More	5-9
5.8. Adjusted Annual Per Capita Cost of Government-insured Health Services by Age and Sex in 1974	5-10
5.9. Projections of Government-insured Health Expenditures, Low Demographic Growth, 1974 Prices	5-13
5.10. Projections of Government-insured Health Expenditures, High Demographic Growth, 1974 Prices	5-14
5.11. Average Annual Growth Rate of Government-insured Health Expenditures, Broken Down by Component, Basic Demo- graphic Scenarios	5-15
5.12. Evolution of Per Capita GNP and Government-insured Health Expenditures at Constant Relative Prices	5-18
5.13. Annual Average Rate of Growth	5-20
5.14. Projection of Demand	5-21
5.15. Bacteriology Demand Projection	5-23
5.16. Biochemistry Demand Projection	5-23
5.17. Blood Bank Demand Projection	5-24
5.18. Blood Coagulation Demand Projection	5-24
5.19. Hematology Demand Projection	5-25
5.20. Immunology Demand Projection	5-25
5.21. Radio-immunoassay Demand Projection	5-26
5.22. Serology Demand Projection	5-26
5.23. Urinalysis Demand Projection	5-27
5.24. Virology Demand Projection	5-27

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1.0 GENERAL

## 1. GENERAL

### 1.1 Introduction

During the last two decades, the clinical laboratory reagent area has been a restless, changing and dynamic field.

In the past decade, many dramatic changes have taken place in fields such as immunology, biochemistry, hematology, radio-immuno assay, etc.

Hundreds of new products, including those of entirely new industries, such as high technology instrumentation, have appeared on the market.

Bacteriology, blood bank and blood coagulation have not been moving at the same speed as the above-mentioned disciplines, but even here, numerous changes have taken place.

The dramatic changes which appeared in the diagnostic area called for alertness in research, production and marketing of all individual companies.

The multinational companies found an attractive market place in Canada, since Canadian research and development in the diagnostic area is negligible.

Based on the estimates of Galasco Consultants Ltd., the diagnostic market (of the ten major disciplines under study) in Canada is of the order of \$ 66.5 million. The vast majority of these products is imported. Taking into account a conservative 10% per annum dollar increase in the market, the Canadian consumption of diagnostic products should attain by the year 2000 \$585 million. If the imports by year 2000 are similar to actual 90-95% of the total consumption, Canada would import \$ 540 million per annum, which would be a heavy burden on the Canadian balance of payments.

Among many other considerations, this endeavour is, in the view of Galasco, closely dependent on domestic industrial ability not only to negotiate successfully new distribution of diagnostic products, but also, and at least equally importantly, to select investments commensurate with their development objectives and targets. It is, therefore, imperative that domestic industry continue its effort to improve the development strategies of new products, which constitute the framework within which the investment takes place. The selection of such new product development projects has to be undertaken so as to ensure the optimum utilization of scarce human resources towards meeting economic growth.

### 1.2 Objectives of The Survey

The basic objectives of the study are:

- to evaluate the size of the Canadian market for reagent groups such as:

- bacteriology
  - biochemistry
  - blood bank
  - blood coagulation
  - hematology
  - immunology
  - radio-immuno assay
  - serology
  - urinalysis
  - virology
- 
- to select products and/or product groups which offer potential opportunities for Canadian manufacturers
  - to identify problems encountered in establishing and/or expanding a domestic manufacturing facility serving the Canadian (and export) market
  - to assess the market shares of major suppliers
  - to analyse the market trends by product group
  - to analyse the attitude of buyers and/or end users towards Canadian brands:
    - general behaviours, intentions and motivation of buyers and/or end users
    - buying influences (price, quality, general brand selection, promoters)
    - buying criteria
    - users' opinion of products and supply
  - to identify the effect of hospital budgetary cut-backs and group purchasing on small Canadian manufacturers
  - to recommend alternative actions to be undertaken by the government to promote local manufacturing:
    - assistance in research
    - assistance in financing
    - promotion of export markets

### 1.3 Survey Methodology

Available statistics, publications and research papers were identified and used as background information. Interviews were conducted with major producers, distributors and government officials to substantiate and complement work already completed in this field. The consultant's

previous multi-client surveys, as well as available statistics, were used to study past consumption, market size, growth, strength of competition, and other factors of importance to the survey.

The following multi-client surveys conducted in the past by Galasco were consulted during the study:

- RA (uptake and CPB) & RIA	1976
- Biochemistry	1976
- Bacteriology	1976
- Hematology	1976
- Pregnancy Testing	1976
- Blood Bank	1977
- Blood Coagulation	1977
- Immunology	1977
- Biochemistry	1979
- RA & RIA	1979

In order to improve on the statistical precision of the survey, as well as to be in a position to analyse market segmentation, Galasco has stratified the universe as follows:

General Hospitals:

Stratum	I	-	hospitals up to 100 beds
Stratum	II	-	hospitals of 101 to 200 beds
Stratum	III	-	hospitals of 201 to 400 beds
Stratum	IV	-	hospitals of 401 to 700 beds
Stratum	V	-	hospitals of 701 beds and over
Stratum	VI	-	private laboratories and provincial laboratories

For identification of the total universe and sample-taking, the latest edition of the "Canadian Hospital Directory" and Galasco's private and provincial laboratory mailing lists have been used.

One phase of sample design in which both good judgement and mathematical knowledge are needed, is the selection of the most appropriate and effective sampling procedure. In order to achieve the objectives, Galasco has used, within each stratum, a special form of probability sampling called simple random sampling.

S.R.S. is a process of sample selection in which the units are chosen individually and directly through a random process, in which each unselected unit has the same chance of being selected as every other unit in each draw.

Within each stratum, the units were sequentially numbered. The sample was chosen by applying a chance selection process to the numbers corresponding to the list.

Cost of sampling having been equal in each stratum, the sample size as calculated by using Neyman allocation:

$$n = \frac{\sum_{h=1}^L (\epsilon W_h S_h)^2}{V + \frac{1}{N} \sum_{h=1}^L \epsilon W_h S_h^2}$$

Advance estimate of population variances were calculated by the geometric approximation:

$$\frac{h_1 + h_2 + h_3}{3} \quad \frac{h_3^2 - 2h_2h_3 - 2h_1h_2 + 2h_2 + h_1^2}{18}$$

Where  $h_1$  is the lowest value in the distribution  
 $h_2$  is the highest value in the distribution  
 $h_3$  is the value with the highest frequency

The total hospital universe (general hospitals) is in the range of 850, out of which 533 fall within Stratum I.

A total of 260 hospitals was selected, and questionnaires mailed on the ten disciplines.

A total of 27 private laboratories was selected (out of the total number of 450) and questionnaires mailed on the ten disciplines.

Questionnaires were sent to all of the ten provincial laboratories.

The total universe is therefore of the range of 1,310.

Purchasing groups were also contacted for each type of information. General statistics were requested from government agencies.

The projection for the total Canadian Market is based on the following returned and usable questionnaires from hospitals:

- Bacteriology 36
- Biochemistry 30
- Blood Bank 59



- Blood Coagulation	35
- Hematology	23
- Immunology	26
- Radio-Immuno Assay	26
- Serology	21
- Urinalysis	26
- Virology	21

This is equivalent to a sample of approximately 3.5%.

In order to comment on the market environment in Canada, major manufacturers and distributors were interviewed.

#### 1.4 Acknowledgements

The Department of Regional Economic Expansion (DREE) retained the services of Galasco Consultants Ltd. on February 21, 1980, for the preparation of a market study on Clinical Laboratory Reagents in accordance with our Proposal No. 322 dated January 22, 1980.

The findings of this report are based mainly on the opinions of the end users from coast to coast. The consultant would, first and foremost, like to express gratitude to the many respondents in hospitals, private and provincial laboratories who graciously collaborated in the data collection, and without whom this survey would not have been possible.

The consultant is also indebted to the Department of Regional Economic Expansion, the manufacturers and the distributors for their help, advice and information.

The project team was headed by Mrs. Margarita Galantai, who was responsible for the basic concept and the scope of the study. She was assisted by several experts in the fields of statistics, computer applications, etc.

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2.0 EXECUTIVE SUMMARY

## 2. EXECUTIVE SUMMARY

### 2.1. Current Canadian Market

The total estimated Canadian market for laboratory reagents is estimated at \$ 66.5 million, broken down by discipline, as follows:

- Biochemistry	\$ 17,100,000
- Bacteriology	11,531,000
- Radio-immunoassay	9,827,000
- Hematology	8,092,000
- Blood Bank	4,835,000
- Urinalysis	3,785,000
- Serology	3,287,000
- Virology	2,992,000
- Blood Coagulation	2,891,000
- Immunology	<u>2,175,000</u>
- Total	\$ 66,515,000

The largest market is biochemistry, accounting for approximately 25 % of the total expenditure.

The second largest field is bacteriology, approximating 17 % of the market, followed by radio-immunoassay, blood bank, urinalysis, serology, etc., accounting for respectively 15 %, 12 %, 7 %, 6 % and 5 % of total expenditure.

In general, the largest market for these products is in hospitals of 401 to 700 beds and 701 beds and over, as well as the private and government laboratories.

Ontario is the largest consumer of laboratory reagents, accounting for 34 - 39 % of the total market, followed by Quebec, varying between 29 % and 32 % of the total market, depending on the discipline. Expenditures in B. C. and the Prairies vary between 10 % and 18 %. The Maritimes represent the smallest market, accounting for 4 to 9 % of the total market.

The market leaders are different in each discipline, although those accounting for the largest sales are multinationals. The largest Canadian manufacturers (in alphabetical order) are:

- "Institut Armand Frappier"
- Bio-Ria
- Connaught
- RIA Inc.

The most important factors in brand selection generally are: quality, ease of use, price and service.

## 2.2. Market Environment

The Canadian diagnostic market is dominated by large multinational companies. The top 30 diagnostic companies, which share about 80 to 85 % of the market, are all subsidiaries of large, foreign-owned multinational corporations.

Generally, the Canadian market is characterized by:

- an extensive price and product competition
- improvement in efficiency in both manufacturing and marketing
- low expenditure in research and development.

## 2.3. Demand Projection

The total expenditures in Canada on laboratory reagents will be of the order of \$ 66.5 million in 1980. Based on the Consultant's estimate, the total expenditure by 1985 will be of the order of \$ 113 million. Assuming the same annual average rate of growth between 1986 and 2000, as estimated for the next five years, total expenditure in the year 2000 will be of the order of \$ 585 million.

If the local manufacturing content of the above expenditures is maintained at between 5 and 10 %, Canada will import laboratory reagents by the year 2000 of the order of \$ 540 million.

The fastest growing segments of the laboratory reagent market are: bacteriology and biochemistry (13 % per annum) and immunology (12 % per annum).

## 2.4. Manufacturing Opportunities

Since the Consultant's mandate did not include the evaluation of financial return on investment of the identified opportunities in this preliminary study, the recommendations are only based on a market potential point of view.

In the opinion of the Consultant, in order to achieve quick market penetration, the best opportunities are in the fields of exclusive preparations, if possible in the area of cardio-vascular disease, cancer or venereal disease (V. D.) diagnosis.

If a company wishes to enter the diagnostic market without offering an exclusive preparation, an area should be chosen where a change in technology is about to take place, for example:

- in Bacteriology, where automation is going to have an impact,
- in Radio-immuno-assay (RIA), where enzymatic and fluorescent or even stable isotopes are potential prospects,
- in Blood Coagulation, where the chromogenic peptide assay may soon replace other well established techniques such as Partial Thromboplastin Time (PTT).

The Consultant also requested the end-users to identify the "improvements needed" in each section. The comments on this question enable the potential manufacturer to assess the weakness of the products of competition versus the strength and merits of his own product or product lines, and enter an area where the end-users are dissatisfied with one or more of the aspects of the products on the market, such as quality, price, service, ease of use, availability, etc.

The requirements for success for manufacturing concerns in Canada can be summarized as follows:

- establishment of a well planned marketing strategy
- optimum selection of product mix, in the area recommended above
- competitive product or product line in quality, price, service, ease of use, availability, etc.
- Due to the economy of scale and heavy research cost, the plant capacity should be sized for an international vocation.
- A substantial budget for the penetration of national and international markets should be foreseen.
- establishment of a well planned territory coverage (either through direct or indirect selling practices), etc.

It should, however, be pointed out that the identification of opportunities for Canadian manufacturing can be approached in two ways:

- by identifying a number of potential products in a few areas, as recommended above
- by evaluating the potential for the creation of a Canadian laboratory reagent manufacturing industry with a vocation for national and international markets, and with the collaboration of the existing Canadian manufacturers.

The Consultant recommends the second alternative to investigate in depth the potential for the creation of a Canadian laboratory reagent manufacturing industry.

The above recommendation is based on the following arguments:

- A number of small Canadian firms operate successfully in this area but a high growth rate in the individual companies is unlikely.
- The Canadian market is most attractive to foreign firms.
- The aging Canadian population will require higher health care expenditures.
- If products are accepted by the Canadian market, they will be accepted in the international market.
- This would be a project of national pride.
- It would decrease dependence on foreign currency, improving the balance of payments and generally reduce foreign dependence.

- Canada has all the human resources to build and operate this project.
- Canada possesses the general technology required for research, implementation and operation of a project of this magnitude.

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2.0 RESUME POUR CADRES

## 2.1. Marché Canadien Actuel

Le marché total des réactifs de laboratoire au Canada peut être estimé à \$ 66.5 millions. Le marché par discipline est le suivant:

- biochimie	\$ 17,100,000
- bactériologie	11,531,000
- dosages radio-immunologiques	9,827,000
- hématologie	8,092,000
- banque de sang	4,835,000
- analyse urinaire	3,785,000
- sérologie	3,287,000
- virologie	2,992,000
- coagulation	2,891,000
- immunologie	2,175,000
Total	\$ 66,515,000

La biochimie est le marché le plus important, représentant à elle seule 25 % des dépenses totales. Le domaine de la bactériologie est en deuxième place avec environ 17 % du marché, après quoi viennent les dosages radio-immunologiques, la banque de sang, les analyses urinaires, la sérologie, etc., représentant 15 %, 12 %, 7 %, 6 % et 5 % des dépenses totales.

C'est dans les hôpitaux de 401 à 700 lits et dans ceux de 701 lits et plus, ainsi que dans les laboratoires privés et gouvernementaux que les dépenses en réactifs sont les plus élevées.

L'Ontario est le plus important consommateur de réactifs de laboratoire, avec 34 à 39 % du marché total, suivi par le Québec avec une part de 29 à 32 % d'après la discipline. Les dépenses en Colombie Britannique et dans les Prairies se situent entre 10 et 18 %. Les provinces Atlantiques représentent le plus petit marché, qui varie entre 4 et 9 % du marché total.

Les compagnies principales ne sont pas nécessairement les mêmes pour les dix différentes disciplines évaluées. Ce sont les multinationales qui ont les parts les plus importantes. Les plus grands fabricants strictement canadiens sont (par ordre alphabétique):

- L'Institut Armand Frappier
- Bio-Ria
- Connaught
- RIA Inc.



Les facteurs qui influencent le plus le choix d'une marque de produit sont, en général, la qualité, la facilité d'emploi, le prix et le service

## 2.2. Marché Concurrentiel

Le marché canadien des réactifs à l'usage diagnostique est dominé par des grandes compagnies multinationales. Les 30 compagnies en tête de liste partagent de 80 % à 85 % du marché. Elles sont toutes filiales de grandes corporations multinationales étrangères.

Le marché canadien est, en général, caractérisé par:

- une forte concurrence dans le domaine des produits et des prix
- l'amélioration continue de l'efficacité sur le plan de la fabrication et de la mise-en-marché
- des dépenses minimales en recherche et développement

## 2.3. Projection de la Demande

Les dépenses totales au Canada pour les réactifs de laboratoire s'élèvent à \$ 66.5 millions pour l'année 1980. D'après l'évaluation du Consultant, ces dépenses atteindront \$ 113 millions d'ici 1985. En supposant que l'augmentation prévue pour les cinq prochaines années persiste jusqu'en 2000, le marché total des réactifs de laboratoire sera alors de l'ordre de \$ 585 millions.

Si la part de la fabrication domestique continue à ne pas dépasser 5 % à 10 %, le Canada importera pour \$ 540 millions de réactifs de laboratoire en l'an 2000:

Les secteurs jouissant de la croissance la plus importante sont la bactériologie, dont l'augmentation annuelle atteint 13 %, et la biochimie, avec une augmentation de 12 %.

## 2.4. Possibilités de Fabrication Canadienne

Comme le mandat du Consultant ne comprenait pas l'évaluation des bénéfices sur l'investissement pour les possibilités identifiées dans cette étude préliminaire, les recommandations sont donc basées uniquement sur le potentiel du marché.

D'après le Consultant, afin de réaliser une pénétration rapide du marché, les meilleures possibilités seront dans le domaine des préparations exclusives, telles que le diagnostic des maladies cardio-vasculaires, du cancer et des maladies vénériennes. Si une compagnie souhaite se lancer sur le marché des produits diagnostiques sans offrir une préparation exclusive, il faudrait choisir un domaine où un changement de technologie est prévu. Par exemple, on peut citer:

- la bactériologie, où l'automatisation sera responsable de changements
- le dosage radio-immunologique, où les méthodes enzymatiques ou fluorescentes ou même des isotopes stables offrent des possibilités importantes
- la coagulation, où le dosage de peptides chromogéniques pourra remplacer la méthode PTT.

Le Consultant a aussi demandé aux utilisateurs d'identifier les améliorations requises dans chaque secteur étudié. Les commentaires sur ces questions permettront aux fabricants d'évaluer les faiblesses des produits concurrents comparées aux avantages de ses propres produits ou lignes de produits, et se lancer dans un secteur où les utilisateurs ne sont pas satisfaits quant à la qualité, le prix, le service, la facilité d'emploi ou la disponibilité des produits existants.

On peut résumer les conditions de succès pour un fabricant au Canada de la façon suivante:

- mise-sur-pied de stratégies de marketing bien planifiées
- meilleure sélection possible de produits dans les secteurs recommandés ci-dessus
- produits ou lignes de produits dont la qualité, le prix, le service, la facilité d'emploi et ainsi de suite sont compétitifs
- A cause des économies d'échelle possibles à réaliser et des coûts de recherche élevés, la capacité de l'usine doit tenir compte de la vocation internationale de la compagnie.
- Un budget considérable pour pénétrer les marchés local et étrangers doit être prévu.
- bonne planification des visites des vendeurs (vente directe ou indirecte) etc.

Il faut, cependant, souligner que l'identification des possibilités de fabrication canadienne peut être regardée de deux points de vue:

- identification d'un certain marché dans un nombre limité de secteurs, tel que proposé plus haut
- évaluation de la possibilité d'établissement d'une industrie de fabrication de réactifs purement canadienne, avec une vocation nationale et internationale, s'appuyant sur la collaboration des fabricants existants.

Le Consultant recommande la deuxième possibilité pour la création d'une industrie de fabrication de réactifs. Cette recommandation est basée sur les arguments suivants:

- Un nombre limité de petites compagnies travaillent déjà avec succès dans ce secteur, mais leur croissance rapide est improbable.
- Le marché canadien attire bon nombre de compagnies étrangères.
- Le vieillissement de la population canadienne exigera une augmentation des dépenses dans le domaine de la santé.
- Des produits acceptés pour le marché canadien le seront aussi pour le marché international.
- Ce projet en sera un digne de fierté nationale.
- Grâce au projet, le Canada pourrait réduire sa dépendance des devises étrangères, ce qui apportera une amélioration de la balance des paiements, et réduira en général la dépendance de l'étranger.
- On a, au Canada, toutes les ressources humaines nécessaires pour construire et faire marcher ce projet.
- Le Canada est en possession de la technologie générale exigée pour la recherche, la mise-en-oeuvre et la fabrication par un projet de cette envergure.

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3.0 QUANTITATIVE AND  
QUALITATIVE RESEARCH

### 3. QUANTITATIVE AND QUALITATIVE RESEARCH

#### 3.1 General

Diagnostic reagents are substances employed to produce chemical reactions subserving diagnostics. These reagents can be grouped into ten main categories such as:- bacteriology (also called microbiology), biochemistry (also called clinical chemistry), blood bank, blood coagulation, hematology, immunology, RA & RIA, serology, urinalysis and virology.

##### 3.1.1 Bacteriology

Bacteriology is the science which deals with bacteria. In this particular subject, we concentrate on medical bacteriology, the branch of bacteriology which deals with the microorganisms that cause disease in the body. There are many reagents used in the medical laboratory to identify bacteria. They can be grouped into:- dehydrated media, prepared media, antisera, hemoculture or blood culture, antibiotic sensitivity discs, rapid urine screening (dip slides) and rapid enterobacteria identification.

Dehydrated media are used to obtain the prepared media, and prepared media are used for bacterial cultures. In other words, dehydrated media form the raw material used to obtain prepared media.

Laboratories either buy dehydrated or prepared media, but usually they do not buy both. These prepared media are poured into Petri dishes or tubes, and are used to grow different bacteria.

Bacterial antisera are used for the identification of the different groups of streptococci, salmonella, shigella, E. Coli, etc.

Hemoculture or blood culture bottles are used to grow microorganisms which may be found in the blood.

Antibiotic sensitivity discs are used for testing bacterial sensitivity to chemotherapeutic agents. This test helps the physician to select the most effective antibiotic against the invading organisms.

Dip slides are a special type of prepared media fixed on to glass slides. Bacterial growth can be demonstrated on them upon immersion into infected urine.

There are several systems used for rapid identification of enterobacteria. These systems fall into the last group, called enterobacteria identification. The major suppliers are:- Difco, BBL, Oxoid, General Diagnostics, Analytab, Pfizer, Institut A. Frappier, Roche and ICN. They are all U.S. companies, except for Institut A. Frappier, which is Canadian, and Roche, a Swiss company.

### 3.1.2 Biochemistry

Biochemistry, in other words, is the chemistry of living organisms and of vital processes.

The biochemistry or clinical chemistry laboratory is probably the biggest and the busiest of all laboratories performing tests to detect general chemical pathologies. Depending on the size of the hospital, the laboratory may perform these tests by manual, semi-automated or fully automated methods.

Biochemistry reagents are, therefore, designed for either manual, semi-automated or fully automated methods.

The most important tests are albumin, acid phosphatase, alkaline phosphatase, amylase, bilirubin, blood gas, BUN, calcium total, CO<sub>2</sub>, chloride, cholesterol, CPK, creatinine, glucose, SGOT, SGPT, iron, LDH, phosphorus, potassium, sodium, triglycerides, total protein, uric acid and controls & standards. There are reagents for each of the above tests for the three methods. The manual test reagents are usually in a more expensive kit form while the automated test reagents can often be bought in bulk.

Biochemistry is a highly automated field. Laboratories often have more than one chemistry analyser.

Some of these analysers are smaller, with only one channel, while some are multi-channel and computer-controlled.

Biochemistry is the largest segment of the diagnostic market. Most of the suppliers are subsidiaries of U.S. companies. There are a few European and one or two Canadian companies.

The most important suppliers are Abbott, Technicon, BMC (Boehringer-Mannheim Corporation), Worthington, Calbiochem (Hoechst), SKI (Smith Klein & Instrument), BDH, General Diagnostics, Hyland, Ortho, Dade, Pharmacia and American Monitor. Diagnostic Chemicals, a Canadian manufacturer, is based in the Maritimes.

### 3.1.3 Blood Bank

Blood bank laboratories are involved in defining the blood groups of the donors and those of the recipients.

The ABO blood group system includes four distinct groups of agglutination reaction.

Transfusion of an individual with red blood cells from an individual of a different group results in destruction of these cells.

The rhesus blood group system is the next most important system after the ABO group.

The rhesus (Rh) group of an individual must also be taken into account for transfusion purposes. Attempts at blood transfusion were recorded as far back as the XVIth century. Initially, attempts were made with animal blood and later with human blood into man, but as we now realize, interspecies and intraspecies differences cause severe reactions and, frequently, death. The discovery of the blood groups provided the basis for safer transfusion therapy.

Tests performed by a blood bank laboratory can be grouped into:- ABO grouping, Rh typing, Coombs direct, antibody screening, antibody identification, total indirect Coombs, crossmatch and rare typing. Reagents to perform the above tests are classified as:- ABO grouping and Rh typing sera, bovine albumin, anti-human globulin (or Coombs sera) and red blood cells (or panel cells).

Dominion Biologicals is a Canadian manufacturer from the Maritimes. Ortho is the leader of this market. Other blood bank reagent suppliers (US companies) are Pfizer, Dade, Spectra and Hyland.

#### 3.1.4 Blood Coagulation

Blood coagulation is the process by which a blood clot is formed, in whole blood or plasma.

The blood coagulation laboratory performs different tests by which bleeding disorders can be diagnosed. The most important tests are PT (or prothrombin time), PTT (or partial thromboplastin time), fibrinogen assay and platelet count.

Reagents used to perform the above tests can be classified as:- PT reagents, such as calcium thromboplastin, PTT reagents, fibrinogen, controls, factor (II, V, X) test kits and fibrin split products. General Diagnostics, a division of Warner Lambert, is the market leader. Other major U.S. companies selling blood coagulation reagents are Ortho, Dade and Hyland.

#### 3.1.5 Hematology

Hematology is the branch of biology which deals with the morphology of the blood and blood-forming tissues.

Diluents, controls, standards, rinse and reference solutions and lysing reagents are used in hematology to perform white blood cell, red blood cell and platelet counts, hemoglobin assay and differential.

Hematology is a well automated field and automated cell counters are found in almost all laboratories performing hematology testing. Coulter (a U.S. company) is the market leader. Fisher, Canlab, BDH, Hyland and Ames (all U.S. companies) also have reagents in the hematology field.

#### 3.1.6 Immunology

This is the field of biology which concerns itself with the study of immunity.

The meaning of the term "immunity" as it is used today derives from its earlier usage referring to exemption from military service or paying taxes. Immunology as a science, began in 1890 when anti-bacterial substances were found in the blood of animals immunized against tetanus and diphtheria organisms.

There are two types of immunological determinations, one is qualitative and the other is quantitative. The most frequently used qualitative technique is immunoelectrophoresis (IEP). To perform this test, different types of antisera are used. However, antisera can also be used for semi-quantitative determinations. The quantitative method currently used is called radial immunodiffusion.

Antisera classified under immunology do not include bacterial antisera such as E. Coli and Salmonella, etc. These are included in microbiology.

The antisera here are prealbumin, albumin,  $\alpha_1$ -acid glycoprotein,  $\alpha_1$ -lipoprotein,  $\alpha_1$ -antitrypsin, haptoglobin,  $\beta$ -lipoprotein, transferrin,  $\gamma$ -A globulin or IgA,  $\gamma$ -M globulin or IgM,  $\gamma$ -G globulin or IgG, etc.

The major suppliers are:- Behring Diagnostics ( a German company), Hyland and ICN, the latter distributing for Kallestad. Both Hyland and Kallestad are U.S. companies.

### 3.1.7 RA & RIA

Radioimmunoassay permits the routine quantitation of many protein hormones in body fluids and provides an accurate, sensitive, reproducible, rapid and specific assay which is, approximately 1,000 times more sensitive than most other assay systems.

The reagents supplied are usually in a kit form including buffer and standards.

These reagents are labelled with a radio-active material usually  $I^{125}$  and have to be used within four weeks from preparation date. There are two other techniques still in use called competitive protein binding and uptake. These two are classified as radio assay. The biggest part of the RA & RIA market is for thyroid function tests such as  $T_3$ ,  $T_4$ , and TSH. Hormone assays other than thyroid form the next largest group.

Major suppliers are mostly U.S. companies. There is, however, a Quebec-based company, Bio-Ria, which is a division of Bio-Endo and holds a considerable share of the market. This company also exports to the U.S.A.

RIA Inc., a Toronto based company, has a considerable market share as well. Another Canadian company is Diagnostics Biochem from Ontario. Other multi-nationals holding major shares of the market are Abbott, NML, Clinical Assays (Hyland), Beckman, Amersham, NEN, etc.

### 3.1.8 Serology

Serology by definition is the study of antigen - antibody reactions in vitro.

RF (rheumatoid factor) and ASO (anti-streptolysin O) are two protein constituents which can be detected in human blood plasma in cases of rheumatic disease.

C-reactive protein is found in persons suffering from infection and non-infectious inflammatory conditions.

Lupus erythematosus (LE) is a superficial inflammation of the skin. Infectious mononucleosis or "kissing disease" is again an infectious disease with fever and inflammatory swelling of the lymph nodes.

Serological diagnosis is used to detect rubella, a virus disease with a rash not unlike that of measles.

Testing for venereal diseases and pregnancy can also be classified under this segment.

Reagents used to detect the different diseases discussed under serology are often in a kit form. Most of the microbiology and immunology reagent suppliers have a more or less complete list of serology kits.

Provincial laboratories often provide hospitals with syphilis reagents free of charge.

#### 3.1.9 Urinalysis

Analysis of urine may be used for either one of two purposes. One is to ascertain the existence of body disturbances such as, endocrine or metabolic abnormality in which the kidneys function normally. The second purpose is to detect intrinsic conditions that may adversely affect the kidneys or urinary tract. Diseased kidneys cannot function normally and consequently substances normally retained by the kidney or excreted in small amounts may appear in the urine in large quantities and substances normally excreted may be retained.

Urinalysis is a useful procedure available to the physician as an indicator of health or disease, especially in the areas of metabolic and renal disorders.

Examination of general characteristics and measurements as well as microscopic examination of centrifuged sediments hardly require reagents.

Detection and semiquantitation of bacteria require reagents which have been covered under bacteriology.

Chemically-impregnated reagent strips are available for rapid determinations of urine pH, protein, glucose, etc.

These test strips are routinely used in basic urinalysis and have replaced older, more cumbersome methods.

The two major suppliers are Ames and BMC.

#### 3.1.10 Virology

Virology laboratories are involved in identification of viral agents responsible for viral infections and specific antibodies which are developed by the organism in demonstrable amounts, usually around the end of the first week or little later. The most common viral infections can be classified as:



- viral infections of the alimentary tract
- viral carditis
- viral infections of the central nervous system
- viral infections of the eye
- viral infections of the fetus
- viral infections of the respiratory tract
- viral infections of the skin and mucus membranes

Since viruses can only grow on living cells, artificial culture demands either living animals or tissue culture. Cells are, therefore, used to grow the virus, and identification can be made either by microscopic examination or by using specific antisera.

The main suppliers in virology are Flow, Connaught and Microbiological Associates.

3.2. Bacteriology

3.2.1. General

Bacteriology is a rather important segment of the diagnostic field. Most of the hospitals have a bacteriology laboratory where at least some basic culture and identification is done.

Very small hospitals, however, refer their specimens for testing to either a provincial laboratory or to the closest regional laboratory. Some hospitals have a media room where they produce "prepared media" almost on a daily basis. These prepared media absolutely have to be fresh. Contamination often occurs when the media lose their freshness, or during transportation. This is the reason why local prepared media manufacturers could achieve some success over large companies such as B. B. L.

3.2.2. Total Current (1980) Canadian Market

Table 3.1 shows that expenditure in 1980 on bacteriology reagents is of the order of \$ 11.5 million. 85 % of the total market is in hospitals, and 15 % in private and provincial laboratories.

TABLE 3.1  
ESTIMATED TOTAL BACTERIOLOGY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	2,109	18
Stratum II	1,732	15
Stratum III	2,405	21
Stratum IV	2,663	23
Stratum V	<u>920</u>	<u>8</u>
Sub-total	9,829	85
Stratum VI	<u>1,702</u>	<u>15</u>
Total	11,531	100

In the case of bacteriology reagents, even stratum I hospitals represent an important part of the dollar market, while stratum V is relatively unimportant, not only because of the very small number of hospitals falling into this stratum, but also because of the large quantity discounts obtained.

### 3.2.3. Regional Break-down

Table 3.2, "Bacteriology Market by Region", shows that Ontario is the largest consumer of bacteriology reagents, accounting for 39 % of the total. Quebec follows with 29 %.

TABLE 3.2  
BACTERIOLOGY MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	1,153	10
Prairies	1,729	15
Ontario	4,498	39
Quebec	3,344	29
Maritimes	<u>807</u>	<u>7</u>
Total	11,531	100

The two provinces of Ontario and Quebec alone represent about 68 % of the total Canadian market, while the West only accounts for a total of 25 %.

### 3.2.4. Leading Manufacturers

The bacteriology market is fragmented into a large number of small market shares. There are a large number of companies offering bacteriology products, but most of them do not have a complete product line. The "Institut Armand Frappier" is very strong in the prepared media field, where its sales reach slightly more than \$ 3 million, whereas Analytab is strong in the API system for rapid identification of enterobacteria.

Difco, BBL and Oxoid are the three main suppliers of dehydrated media. Even the "Institut Armand Frappier" buys its dehydrated media from one of these manufacturers. Qualicum is another local small size prepared media producer.

Table 3.3 shows the approximate percentages of the market held by the different suppliers.

TABLE 3.3  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
"Institut A. Frappier"	X		
Analytab	X		
Difco		X	
BBL		X	
Johnston Labs		X	
General Diagnostics			X
Oxoid			X
Roche			X
ICN			X
Gibco			X
Pfizer			X
Qualicum			X
Caltech			X
Fisher			X

The Difco and BBL lines are distributed by Canlab, but the BBL line is also sold by Becton and Dickinson.

### 3.2.5. Importance of Factors in Brand Selection

Table 3.4, entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the different parameters.

By looking at the number 1 ranking position alone, we can see that product quality got an 86 % ranking in this position. The next parameter which got the highest percentage in the number 1 ranking position is service, followed by ease of use, and only afterwards by price.

The frequency of the salesmen's calls does not seem to be too important for end users at the moment a brand is being selected.

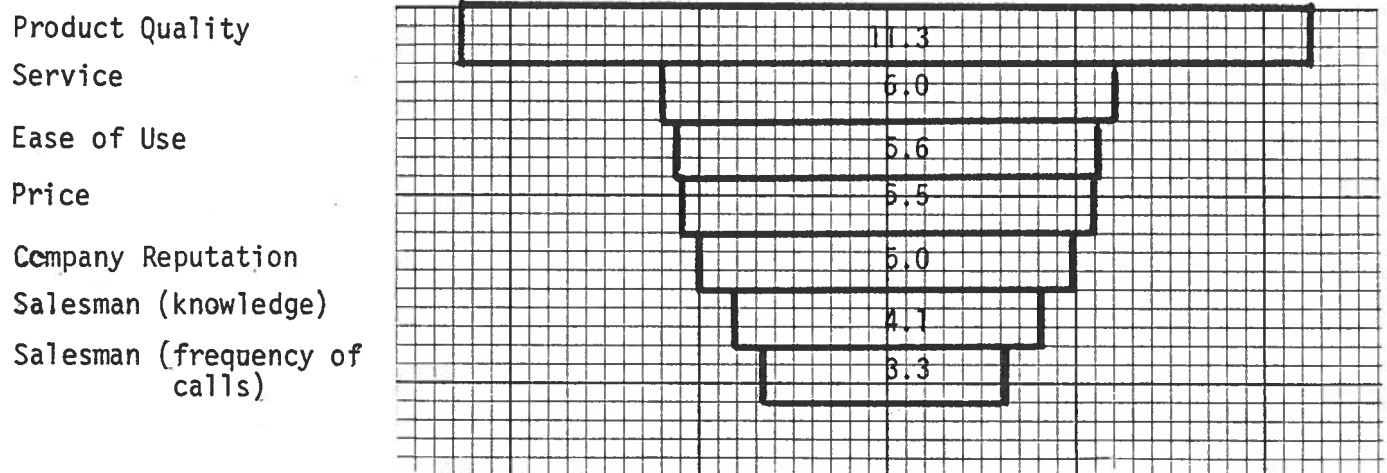
TABLE 3.4  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	32	37	8	13	5	0	5	100
Price	27	24	27	13	3	3	3	100
Service	46	32	14	0	0	5	3	100
Salesman (knowledge)	11	14	22	16	13	16	8	100
Salesman (frequency of calls)	3	14	17	14	14	8	30	100
Company Reputation	25	17	25	6	14	8	5	100
Product Quality	86	6	0	0	0	0	8	100

The table below takes into consideration each of the seven rankings positions. It shows that a company must be able to demonstrate that its product quality is of a high standard to obtain acceptance. Service, which actually means delivery, ease of use, price and company reputation seem to be almost equally important in brand selection.

Respondents seem to give little weight to the salesman. However, it is well known in this field that without a good salesman the message on quality, ease of use, etc. does not reach the client. It is therefore of great importance to have properly trained representatives on the road.

TABLE 3.5  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS



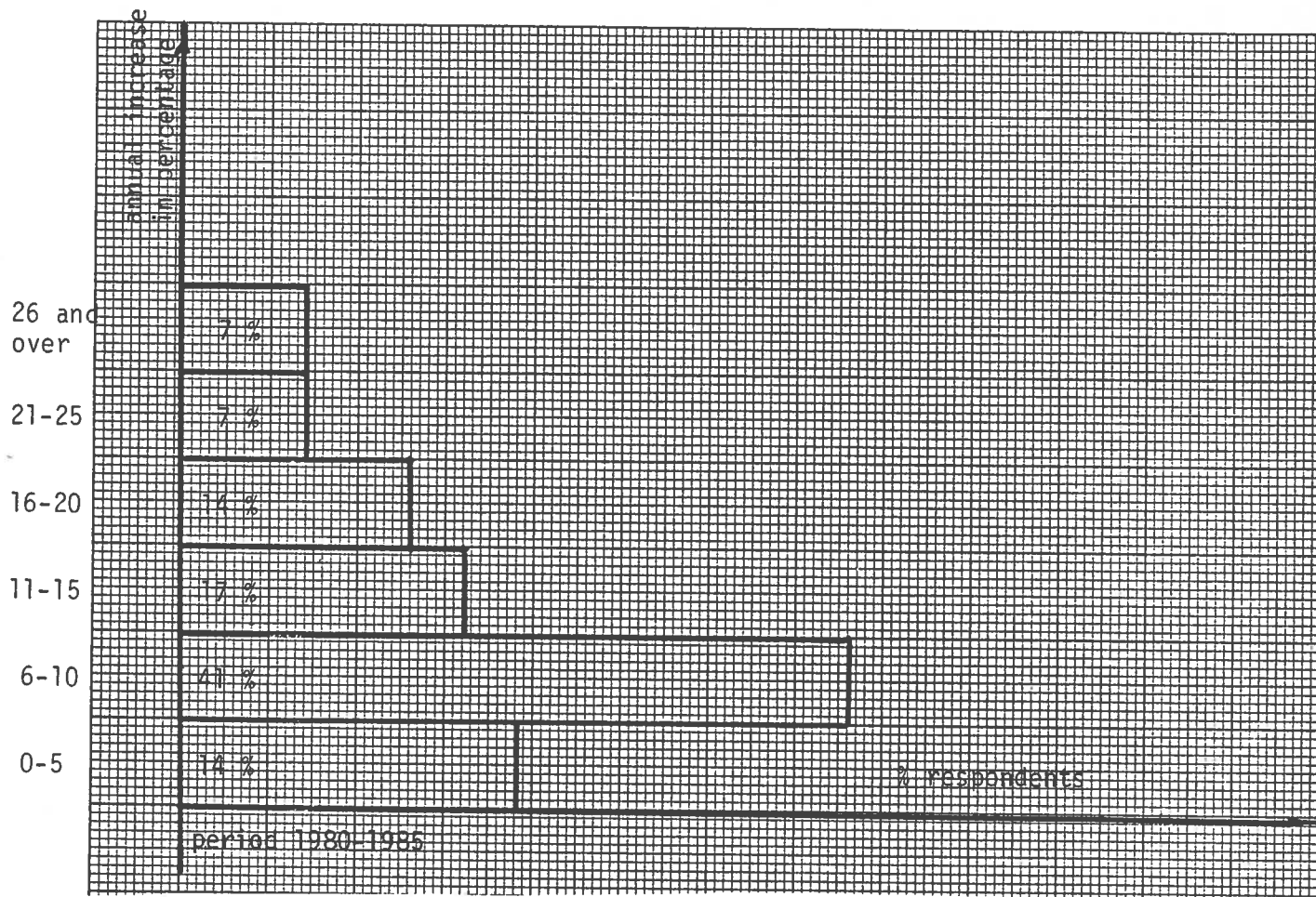
3.2.6. Market Trend Estimated by End User

Table 3.6, "Market Trend Estimated by End User", shows the respondents' budget increase expectations for the next five years.

The table below shows that 41 % of the respondents felt that, for the period 1980 to 1985, their bacteriology reagent budget would increase from 6 to 10 % per annum.

The average increase given is 10.9 % yearly. According to this estimate the bacteriology market will reach \$ 19.3 million by 1985.

TABLE 3.6  
MARKET TREND ESTIMATED BY END USER



3.2.7. Desirability of Canadian-made Products by End Users

96 % of the respondents indicated that they would like to see Canadian firms manufacturing bacteriology reagents. Only 4 % felt that there was no opportunity for local manufacturing.

Respondents were asked to specify the type of products which would offer some potential for a local manufacturer. The following table shows the specific products or product groups which were suggested, in a decreasing order of frequency.

28 %	dipsticks
28 %	prepared media
15 %	all products
10 %	bacterial antisera
8 %	blood products and blood culture bottles
5 %	special media and supplements
3 %	enterobacteria identification
3 %	staining reagents

The above shows that there is a good opportunity for Canadian production of dipsticks for bacterial identification in urine and that the opportunity for prepared media production is also good. These two types of product are relatively easy to manufacture, while production of bacterial antisera requires much more advanced technology and an animal farm.

The respondents were also asked:

"Should Canadian manufactured bacteriology reagents be available, under what circumstances would you select them over U. S. or European brands?"

The answers to this open-ended question can be summarized as follows: 34 % want comparable quality, 25 % comparable price, 21 % equal service and availability (which actually means no back-orders), 4 % ease of use, 3 % good company reputation, 3 % salesmen with good product knowledge, 2% salesmen who call frequently, and finally, 1 % want comparable stability. A total of 4 % would like better prices and service and another 3 % indicated that they would opt for Canadian products whenever possible.

The answers to this question clearly show that a Canadian manufacturer must be able to market a product or a product line, the quality of which would be at least equal if not superior to the products presently on the market. Price seems to be the next most important factor. In other words, the Canadian product, in order to achieve a good market penetration, has to be cheaper than the non-Canadian products. We can assume that, out of two products of equal quality, chances are strong that the cheapest will be selected independently of its origin. If service is not satisfactory, end users can still switch to a more expensive brand made by a company which offers better service.

### 3.2.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The answers can be summarized as follows.



Availability	39 %
Price	24 %
Back Order Situation	17 %
Quality	9 %
Service	2 %
Government Control	2 %
Canadian Labelling	2 %
Shipping Temperature	2 %
Larger Sizes (Packaging)	2 %
Shelf Life	1 %

The above shows that availability, service and delivery cause far more problems than the products themselves. A total of 58 % of respondents desire improvements in the former, as compared to 24 % who want lower prices.

This confirms again that a Canadian manufacturer able to produce a product of comparable quality has strong chances of obtaining market penetration if good service can be demonstrated and also if prices are lower than those presently available.

### 3.3 Biochemistry

#### 3.3.1 General

Biochemistry is the biggest of all segments studied.

Most of the tests performed are done on a routine basis and doctors usually request a great number of biochemistry tests on each single blood or urine specimen.

Often they ask for what is called a "profile". Instead of specifying on their requisition the test they really need, they get a complete rundown of 6-12 tests. This is often the case in large bed size hospitals where sophisticated multi-channel chemistry analysers are used for both routine and emergency (STAT) cases. There are hospitals where two or more of such analysers are running constantly during the day, using up a considerable quantity of reagents.

Other facilities not included in this survey, such as universities, research laboratories and industries, also use biochemistry reagents, as well as these multichannel analysers. As an example, Technicon have recently sold more than 100 of these analysers in the Prairies to grain industries and to some other industries concerned with process control.

An industrial study showing the size of the biochemistry market at that level would complement this survey and offer a global picture to potential Canadian manufacturers.

#### 3.3.2 Total Current (1980) Canadian Market

Table 3.7 "Estimates Total Biochemistry Market" shows that the expenditure in 1980 on biochemistry reagents is of the order of \$17 million. 87% of the total market is in hospitals and 13% in private and provincial laboratories.

TABLE 3.7  
ESTIMATED TOTAL BIOCHEMISTRY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	1,150	7
Stratum II	1,848	11
Stratum III	4,656	27
Stratum IV	3,283	19
Stratum V	<u>3,946</u>	<u>23</u>
Sub-total	14,883	87
Stratum VI	<u>2,217</u>	<u>13</u>
Total	17,100	100

The above table shows that small bed size hospitals do not spend a large amount on reagents in spite of the large number of such small hospitals across Canada. Often these small bed size hospitals only perform very few tests and more complicated analysis is referred to a regional hospital laboratory. The testing volume of such hospitals is, therefore, much higher than would be expected compared to other hospitals within the same stratum size.

### 3.3.3 Regional Break-down

Table 3.8 "Biochemistry Market by Region" shows that Ontario is the largest consumer of biochemistry reagents, accounting for 37% of the total consumption, followed by Quebec with 27%.

TABLE 3.8  
BIOCHEMISTRY MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	2,394	14
Prairies	2,223	13
Ontario	6,327	37
Quebec	4,617	27
Maritimes	<u>1,539</u>	<u>9</u>
Total	17,100	100

Ontario and Quebec often represent the target market for all major companies. These two markets are, therefore, the best serviced by multinationals which makes them difficult to penetrate by a small size firm.

The Prairies with its 13% share is a difficult market to penetrate due to the large number of small bed size hospitals. Servicing these accounts is often considered by companies to be unprofitable.

### 3.3.4 Leading Manufacturers

A large number of companies compete in the biochemistry market. There is one Canadian company located in Prince Edward Island, Diagnostic Chemicals Ltd., and another one in Quebec, Ferland. Most of these companies are U.S. or European multinationals.

Table 3.9, entitled "Market Shares of Leading Manufacturers", shows in percentage the approximate dollar penetration of the different companies.

TABLE 3.9  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1% AND MORE	5.1 - 10%	5% AND LESS
Technicon	X		
Abbott	X		
BMC	X		
BDH		X	
Worthington		X	
General Diagnostics		X	
Ortho		X	
Hyland		X	
Calbiochem			X
SKI			X
Dade			X
Ferland			X
American Monitor			X
etc.			

Most of these companies have a complete product line and can offer instrumentation as well.

They also offer reagents for manual, semi-automated and automated testing.

General Diagnostics is a division of Warner Lambert, while Dade products are distributed by Canlab, both owned by McGaw Supply Ltd. Technicon has recently been taken over by Revlon. Worthington belongs to Millipore, and Calbiochem is now owned by Hoechst.

### 3.3.5 Importance Of Factors In Brand Selection

Table 3.10 entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentage of the end users' preferences. The parameters evaluated were ease of use, price, service (delivery), knowledge of salesmen, frequency of salesmen's calls, company reputation and product quality.

By looking at the number one ranking position alone, one can see that 95% of the ratings were in the number one position for product quality followed by 42% for ease of use.

The weighted ranking, which takes into consideration all seven ranking positions, is shown in Table 3.11.

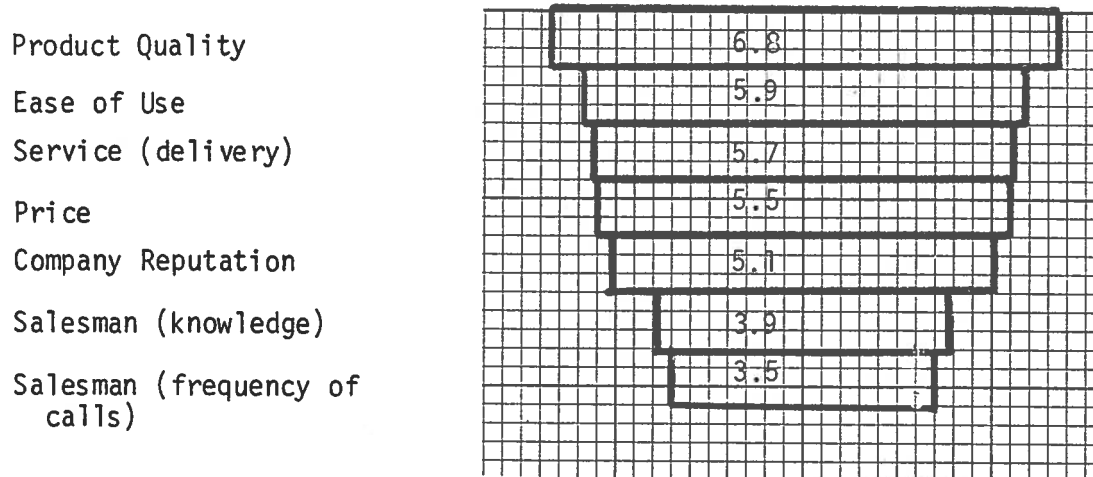
TABLE 3.10

IMPORTANCE OF FACTORS IN BRAND SELECTION

FREQUENCY DISTRIBUTION IN %

<u>PREFERENCE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>TOTAL</u>
Ease of Use	42	34	11	5	5	3	0	100
Price	34	24	24	5	8	3	2	100
Service (delivery)	40	32	10	5	8	5	0	100
Salesman (knowledge)	2	24	16	24	5	13	16	100
Salesman (frequency of calls)	0	16	24	19	5	14	22	100
Company Reputation	13	34	34	5	3	6	5	100
Product Quality	95	3	0	0	0	0	2	100

TABLE 3.11  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS



The above shows the importance of quality. Ease of use is the next most important factor, which means that the technology has to be well designed, the test must be easy to do and also not too time-consuming. Delivery, which refers to back-order situations, is the following most important parameter and price comes after these.

The ranking of these parameters must be clearly borne in mind when the company is preparing its marketing plan, which includes its marketing and sales strategy.

### 3.3.6. Market Trend Estimated by End User

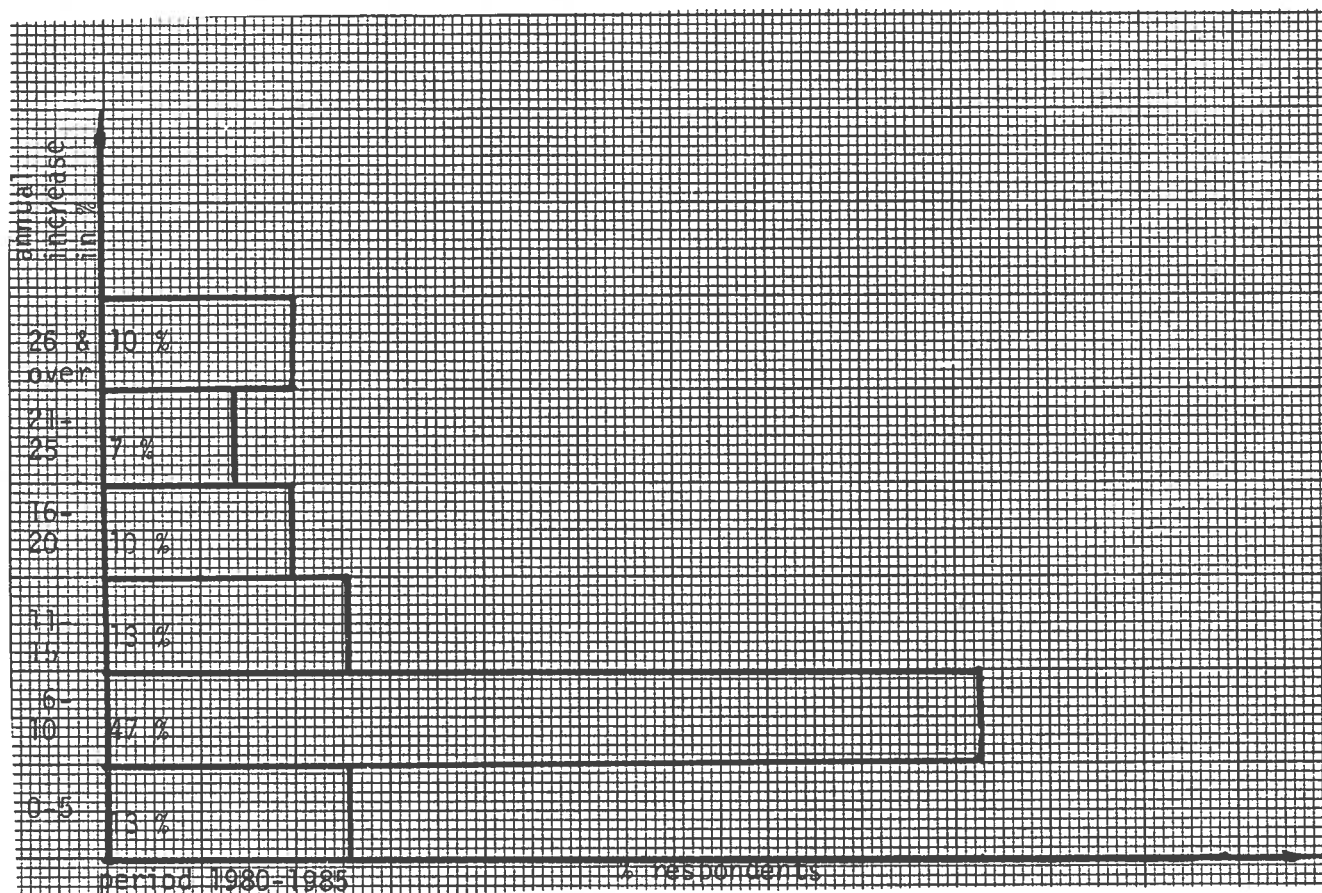
Table 3.6, "Market Trend Estimated by End User", shows the respondents' budget increase expectations for the next five years.

Almost 50 % of the respondents expect a budget increase for reagents which will fall within the 6 to 10 % range.

The average annual rate of budget growth for the next five years estimated by end users is 10.2 %

The total Canadian biochemistry market is estimated at \$ 17,100,000 in 1980. Based on an increase of 10.2 % per annum, the Canadian biochemistry market in 1985 will be of the order of \$ 28,000,000.

TABLE 3.12  
MARKET TREND ESTIMATED BY END USER



3.3.7. Desirability of Canadian-made Products by End Users

In order to give some recommendations regarding Canadian manufacturing, it is very important to understand the attitudes of the Canadian end user towards Canadian-made products.

93 % of the laboratory technologists interviewed were in favour of biochemistry products being manufactured by local firms, while 7 % do not see any opportunity for Canadians in this field.

Respondents were also asked to specify the type of product which could be introduced by a local manufacturer. The following shows their suggestions in a decreasing order of importance.

24 %	enzyme reagents
23 %	all biochemistry reagents
12 %	automated non-enzymes
7 %	reagents for new techniques (ELISA, EMIT, immunofluorescence)
7 %	glucose
6 %	BUN
6 %	blood gas reagents
5 %	flame photometry
5 %	quality assurance (QAS) or quality control programs
5 %	routine reagents

The above shows that a company should offer a complete line. (22 % suggested all reagents and 5 % routine reagents), and, if this is not possible, at least a complete enzyme line.

Respondents were also asked:

"Should Canadian manufactured biochemistry reagents be available, under what circumstances would you select them over U. S. or European brands?"

There were two categories of respondents: some would accept comparable quality (28 %), price (22 %), service (13 %) and salesman knowledge (2 %), and others would definitely ask for better quality (4 %), price (4 %) and service (2 %).

2 % of the respondents mentioned that they would select Canadian products if the labelling showed that the product is Canadian-made.

Some people also would definitely like to be assured that the quality of a Canadian-made product would measure up to that of U. S. products.

### 3.3.8. Improvements Needed

In order to probe further where opportunities lie for Canadian manufacturing, respondents were asked the following question:

"Is there any area where improvements are needed?"

The answers can be summarized as follows:

Availability	47 %
Price	29 %
Quality	18 %
Service (delivery)	3 %
Better purchasing	3 %



3.4. Blood Bank

3.4.1. General

Blood bank reagents represent a relatively small portion of the total diagnostic reagents market.

This category includes products manufactured from human, animal, plant and chemical source materials which are used in donor processing and blood transfusion laboratories, also called blood banks, for the performance and control of blood grouping and typing, determination of patient compatibility, detection of irregular antibodies and identification of irregular antibodies.

The blood bank reagent market does not seem to have a brilliant future. The number of tests performed by laboratories may decrease considerably in the future or, at the best, remain at the same level.

This will be due to better utilization of blood and its components and also to better surgical procedures.

There are no major improvements in this field. Should artificial blood (Green Cross, Japan) be marketed and gain wide acceptance, the number of blood bank tests will show an even further decrease.

Canadian demand is largely covered by Ortho; other companies have smaller market penetration.

3.4.2. Total Current (1980) Canadian Market

Table 3.13., entitled "Estimated Total Blood Bank Market", shows that the total market is in the range of \$ 4.8 million.

TABLE 3.13  
ESTIMATED TOTAL BLOOD BANK MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	407	8
Stratum II	617	13
Stratum III	813	17
Stratum IV	1,054	22
Stratum V	<u>840</u>	<u>17</u>
Sub-total	3,731	77
Stratum VI	<u>1,104</u>	<u>23</u>
Total	4,835	100

The above table shows that 77 % of the total market is in hospitals and 23 % in the other facilities. The major part of the stratum VI testing volume comes from the Canadian Red Cross, where blood collected for transfusion purposes is analysed. Private laboratories do very little blood banking and the same is true of some of the provincial laboratories. Stratum I hospitals represent only 8 % of the total market, probably because little surgery is done in hospitals of a bed size of less than 100.

### 3.4.3. Regional Break-down

Table 3.14, entitled "Blood Bank Market by Region", shows that Ontario and Quebec represent about 63 % of the total market.

TABLE 3.14  
BLOOD BANK MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	532	11
Prairies	822	17
Ontario	1,741	36
Quebec	1,305	27
Maritimes	<u>435</u>	<u>9</u>
Total	4,835	100

### 3.4.4. Leading Manufacturers

Ortho used to have almost a monopoly position in this market. They have, in the past two to three years, lost a considerable part of their market share, especially in the eastern part of Canada. They now have a share of about 57 % of the blood bank market. Pfizer is the second strongest with approximately 23 %, followed by the Canadian company Dominion Biologicals Limited from Nova Scotia.

TABLE 3.15  
MARKET SHARES OF LEADING MANUFACTURERS

Company	IN %		
	10.1 % and more	5.1 % to 10 %	5 % and less
Ortho	X		
Pfizer	X		
D. B. L.	X		
Dade		X	
General Diagnostics			X
Hyland			X
Spectra			X

Most of these companies are selling direct. Dade products are distributed by Canlab.

Dominion Biologicals Limited (D. B. L.) has recently sold 49 % of its shares to Connaught.

General Diagnostics distributes the blood bank line of Biological Corporation. This latter company has recently merged with Spectra, which, in turn, is owned by the holding company called Cooper Lab.

#### 3.4.5. Importance of Factors in Brand Selection

Table 3.16, entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the different parameters.

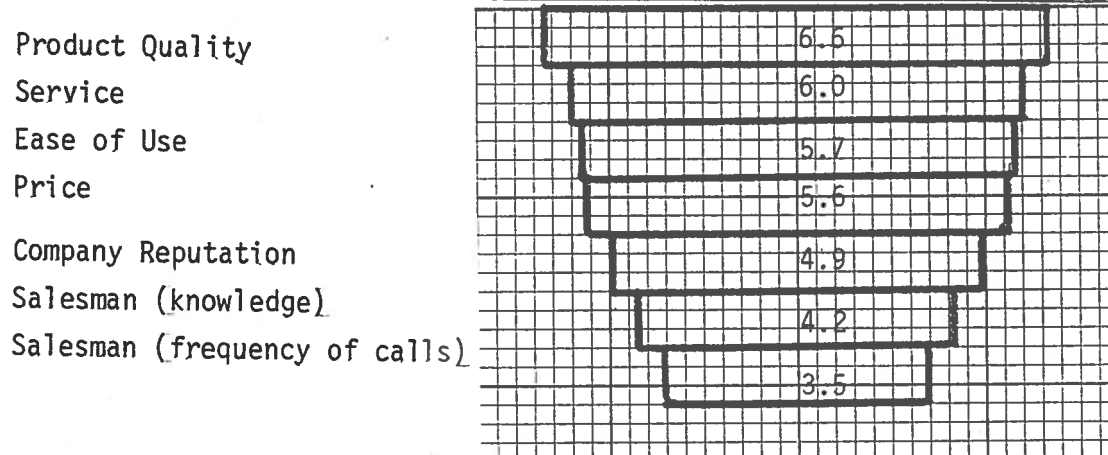
By looking at the number one ranking position only, we can see the importance given to product quality and service.

TABLE 3.16  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	37	29	17	9	3	3	2	100
Price	34	29	18	11	3	2	3	100
Service	55	22	9	6	3	0	5	100
Salesman (knowledge)	9	22	25	14	3	12	15	100
Salesman (frequency of calls)	1	5	25	28	9	20	12	100
Company Reputation	14	29	25	12	12	5	3	100
Product Quality	92	2	0	0	0	0	6	100

Table 3.17, "Importance of Factors in Brand Selection - Weighted", takes into account the weights of each of the seven ranking positions for each of the seven parameters evaluated.

TABLE 3.17  
IMPORTANCE OF FACTORS IN BRAND SELECTION - WEIGHTED

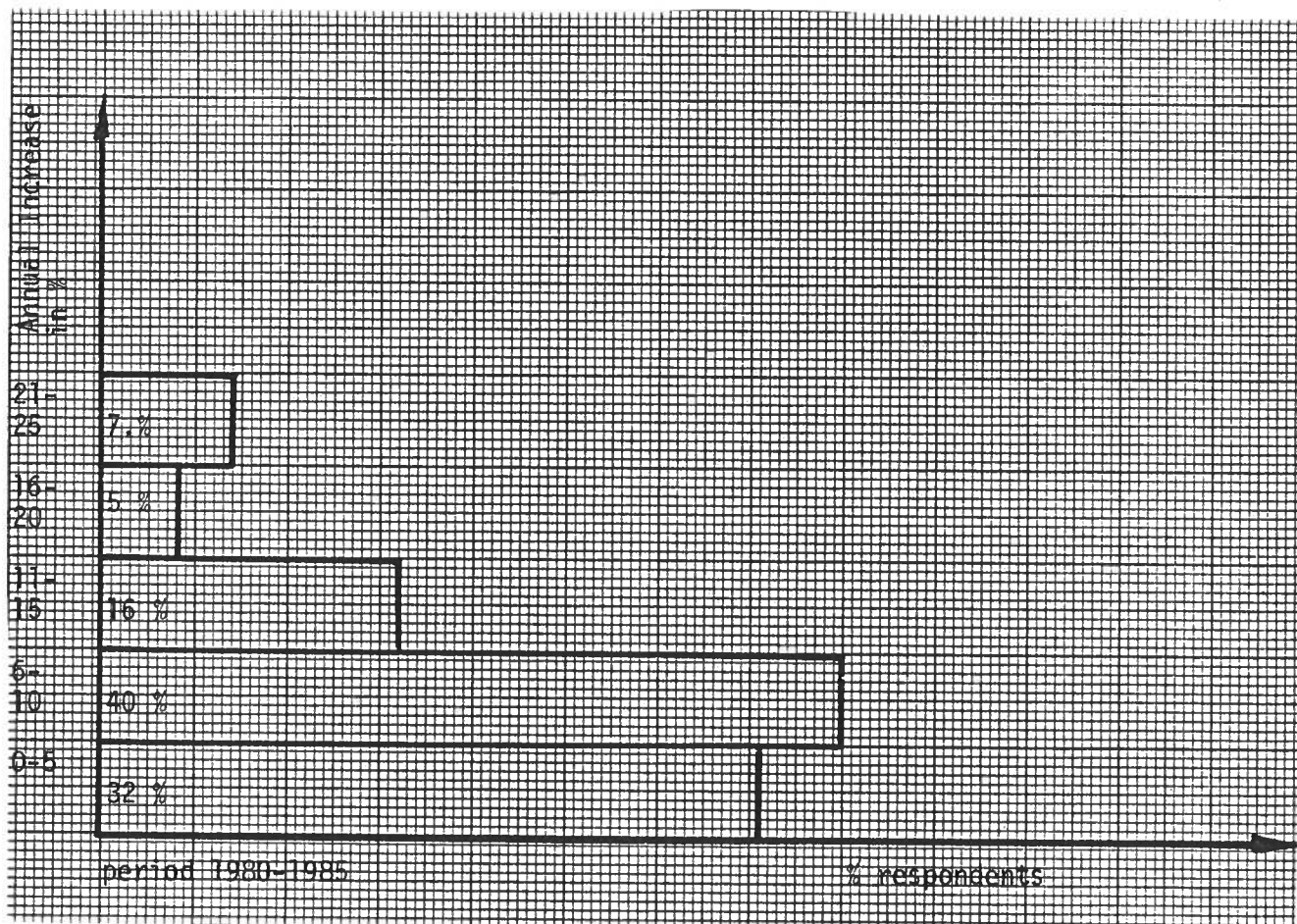


The above table shows that product quality is the most important criterion in brand selection, but also that it is quite closely followed by service. Ease of use and price get very comparable weighted rankings.

3.4.6. Market Trend Estimated by End User

Table 3.18, "Market Trend Estimated by End User", shows the respondents' opinion concerning their blood bank reagent budget increase for the next five years.

TABLE 3.18  
MARKET TREND ESTIMATED BY END USER\*



The above table shows that 40 % of the respondents expect an annual increase of 6 to 10 %, while 32 % only expect an increase of 0 to 5 %.

The average budgetary increase expected in the blood bank field is 9.4 %. According to this estimate, the blood bank market will reach \$ 7.6 million by 1985.

### 3.4.7. Desirability of Canadian-made Products by End User

About 78 % of the respondents feel that there is some opportunity for Canadian manufacturers, while 22 % are against the idea of local manufacturing.

Respondents were asked to specify the type of product which would offer potential for Canadian manufacturing. The following table shows the answers provided in decreasing order of frequency .

25 %	ABO typing sera
22 %	all blood bank products
19 %	Coombs
17 %	control cells
6 %	Rh grouping sera
6 %	albumin
5 %	rare antisera

The above table shows that 47 % recommend the production of at least typing sera, while only 6 % recommend the manufacturing of grouping sera and 19 % recommend Coombs.

Respondents were also asked under what circumstances they would choose a Canadian blood bank product over a U. S. or European brand.

About 88 % would accept something which is comparable to what they are getting now, while 12 % are looking for something better.

30 %	would accept comparable quality
24 %	would accept comparable price
15 %	would accept comparable service
4 %	would accept comparable company reputation
4 %	would accept the same call frequency
4 %	would accept salesmen with the same degree of knowledge
4 %	would accept the same availability
3 %	would accept comparable dating or shelf-life

Out of the 12 % who were looking for better performance, 6 % want better prices, 4 % better quality, 1 % better service and 1 % better availability.

Should the Canadian manufacturer be in a position to demonstrate product quality, be price competitive and give rapid service, the chances of market penetration could be very good.

### 3.4.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

37 %	asked for improvement in price
25 %	in availability
12 %	is satisfied
12 %	asked for improvement in quality
5 %	want more rare antisera
3 %	want improvement in service
2 %	asked for better expiry dates
2 %	want better temperature control during transport
2 %	want less antisera price variation

The above clearly indicates that Canadian manufacturers should offer very good prices in order to gain market penetration even if they have a product the quality of which is comparable to Ortho's or Pfizer's products.

3.5 Blood Coagulation

3.5.1. General

Coagulation reagents and controls are supplied by a few companies, of which General Diagnostics is by far the strongest.

Just as Ortho is often associated with blood bank and Coulter with hematology, General Diagnostics is associated with blood coagulation, due to the strength of these companies in their respective markets.

It seems that a substantial amount of human plasma is required to manufacture blood coagulation reagents, and that some of the plasma required is relatively rare and is not constantly available in Canada.

3.5.2. Total Current (1980) Canadian Market

Table 3.19, entitled "Estimated Total Blood Coagulation Market, shows that 87 % of the total market is in hospitals and 13 % in the other facilities. The total market is estimated at approximately \$ 2.9 million.

TABLE 3.19  
ESTIMATED TOTAL BLOOD COAGULATION MARKET

\$s IN '000s

	EXPENDITURES	%
Stratum I	260	9
Stratum II	405	14
Stratum III	463	16
Stratum IV	780	27
Stratum V	<u>607</u>	<u>21</u>
Sub-Total	2,515	87
Stratum VI	<u>376</u>	<u>13</u>
Total	2,891	100

Hospitals of stratum IV and V represent about 48 % of the total reagent consumption.



3.5.3. Regional Break-down

TABLE 3.20  
BLOOD COAGULATION MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	260	9
Prairies	405	14
Ontario	1,070	37
Quebec	925	32
Maritimes	231	8
Total	2,891	100

The above table shows that 69 % of the blood coagulation market is in Ontario and Quebec. The Prairies represent 14 %, but the trend will probably increase faster in the Prairies, due to population growth, than in any other region.

3.5.4. Leading Manufacturers

General Diagnostics dominates the blood coagulation field, with a market share of approximately 65 %. Ortho is a distant second, followed closely by Dade.

TABLE 3.21  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
General Diagnostics	X		
Ortho	X		
Dade	X		
Bio-Data			X
Hyland			X
Qualicum			X

General Diagnostics, previously called Warner Chilcott, is a division of Warner Lambert. Dade products are exclusively

distributed by Canlab.

### 3.5.5. Importance of Factors in Brand Selection

Table 3.22, entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters.

Once again, it is clear here that quality is accorded overwhelming importance by respondents; 95 % considered it to be top priority. The criterion service follows, though way below quality, with 42 % of respondents ranking it as being of number one importance.

Price and ease of use are accorded almost the same number of rankings in the number one position, whereas the contribution of salesmen and the reputation of the company, once again, seem to have little effect on brand selection.

TABLE 3.22  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	33	42	10	12	0	0	3	100
Price	29	24	34	7	2	2	0	100
Service	42	29	12	12	5	0	0	100
Salesman (knowledge)	8	23	18	15	5	18	13	100
Salesman (frequency of calls)	0	5	25	12	8	12	38	100
Company Reputation	14	24	24	17	17	2	2	100
Product Quality	95	5	0	0	0	0	0	100

The following table, "Importance of Factors in Brand Selection - Weighted Rankings", shows the importance given to each of the seven ranking positions. Product quality is followed by service. Price is only in the third position

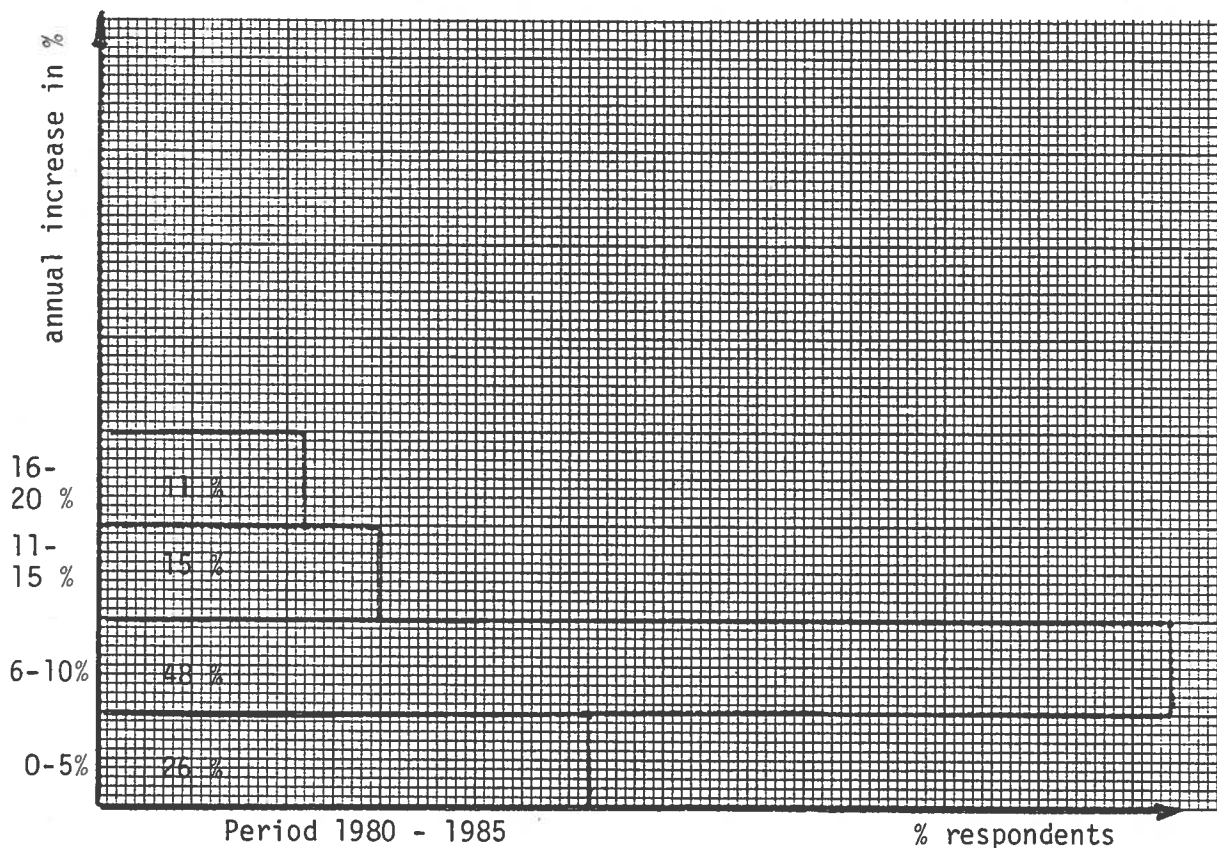
TABLE 3.23  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

Product Quality	7.0
Service	6.0
Price	5.8
Ease of Use	5.5
Company Reputation	4.9
Salesman (knowledge)	4.1
Salesman (frequency of calls)	2.9

3.5.6. Market Trend Estimated by End User

Table 3.25, "Market Trend Estimated by End User shows the respondents' budget increase expectations for the next five years.

TABLE 3.24  
MARKET TREND ESTIMATED BY END USER



48 % of the respondents indicated an average annual increase of 6 - 10 % for the next five years, while 26 % showed an increase of 0 - 5 %.

One may conclude from the above that the coagulation market will not show a rapid increase. The average increase being 8.4 %, the market by 1985 will be of the order of \$ 4.3 million.

### 3.5.7. Desirability of Canadian-made Products by End Users

A total of 81 % of respondents favoured Canadian product, while 19 % saw no chance for Canadian firms in the blood coagulation field.

Respondents were also asked to suggest products which might well be manufactured by Canadian firms. The following table shows their answers in a decreasing order of frequency.

<u>Product</u>	<u>%</u>
P. T.	32
P. T. T.	26
all blood coagulation products	16
Thrombin	6
Cephalin	5
Calcium Chloride	5
Factor Deficient Plasma	5
routine products only	5

Answers were based on a variety of motives, such as whether the respondent considered the market left room for Canadian production, how sophisticated the technology involved was, and whether technicians were frustrated by their source of supply being so remote, as in the case of U. S. companies. It might be argued that laboratory staff are most likely to be influenced by the latter consideration. Furthermore they may be inclined to err on the side of optimism in judging the prospects for Canadian manufacture, considering the question itself, coupled with the aim of the study, a challenge to their patriotism.

Respondents were asked also:

"Should Canadian manufactured blood coagulation products be available, under what circumstances would you select them over U. S. or European brands?"

Here respondents were most concerned with quality; the quality of the Canadian product would have to be equivalent (30 % of responses) or even better (2 % of responses). Price followed closely on the heels of quality, with 28 % stating that they would only choose a Canadian product if the price were equivalent. The third criterion of selection was service with 11 %. The total figures are summarized below.

<u>Criterion</u>	<u>%</u>
Comparable quality	30
Comparable price	28
Comparable service	11
Comparable availability	7
Comparable ease of use	7
Comparable salesman knowledge	4
Comparable company reputation	3
Comparable expiry date	3
Comparable educational benefits	1
Comparable small sizes (packaging)	1

Better quality	2 %
Better service	2 %
Better availability	1

### 3.5.8. Improvements Needed

It is obvious from the table below that the major problem experienced by technicians with their present suppliers is price (31 %), followed by availability (17 %). A relatively high number (23 %) are satisfied. A complete list of desired improvements is given below.

<u>Improvement Desired</u>	<u>%</u>
Price	31
Satisfied	23
Availability	17
Quality	11
Ease of use	3
Service	3
Canadian labelling	3
Less lot to lot variability	3
Better packaging	3
Single lot to facilitate cooperation	3

According to this expression of current buyers' attitudes, a Canadian firm, in order to enter the blood coagulation market would have to offer good availability, coupled with more attractive prices.

3.6. Hematology

3.6.1. General

Hematology is probably the second most automated field in diagnostics, after biochemistry. Coulter is the market leader for both reagents and instrumentation.

The basis of hematologic techniques is correct collection of blood samples and attention to precise methodology. Most of the tests are automated except for very small bed size hospital laboratories. The instruments used are hemoglobino-meters, cell and platelet counters, differential counters and automatic slide stainers.

3.6.2. Total Current (1980) Canadian Market

The total hematology market for reagents, controls and standards is in the \$ 8.1 million range.

Table 3.25, "Estimated Total Hematology Market" shows the break-down by strata.

TABLE 3.25  
ESTIMATED TOTAL HEMATOLOGY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	647	8
Stratum II	972	12
Stratum III	1,699	21
Stratum IV	1,942	24
Stratum V	<u>1,214</u>	<u>15</u>
Sub-total	6,474	80
Stratum VI	<u>1,618</u>	<u>20</u>
Total	8,092	100

The above table shows that stratum IV hospitals represent the biggest market, followed by stratum III, and finally by stratum VI, which groups the private and provincial laboratories.

3.6.3. Regional Break-down

Table 3.26, entitled "Hematology Market by Region", shows that Ontario has the biggest market, followed by Quebec, the two regions totalling 62 %.

TABLE 3.26  
HEMATOLOGY MARKET BY REGION  
\$s IN '000s

	IN \$s	IN %
British Columbia	1,133	14
Prairies	1,457	18
Ontario	2,913	36
Quebec	2,104	26
Maritimes	485	6
Total	8,092	100

3.6.4. Leading Manufacturers

The Canadian hematology market is dominated by Coulter, with a share of 68 %, followed by Fisher and Canlab. The other companies have very low shares indeed. An idea of the competitive picture can be gleaned from the Table 3.27 below. The companies are arranged in decreasing order of market penetration.



TABLE 3.27  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Coulter	X		
Fisher	X		
Canlab		X	
Pfizer			X
O. C. W.			X
Maynard			X
Hycel			X
B. D. H.			X
Ames			X

Maynard is not a manufacturer, but the distributor of the products of a number of companies. The company has recently been taken over by Ingram and Bell. Coulter is very strong in the automated test reagent market, while Fisher and Canlab tend to be active in the manual test market. Coulter is also the strongest in the control market, followed, far below, by Canlab.

Canlab is the distributor of the Dade hematology line.

#### 3.6.5. Importance of Factors in Brand Selection

Table 3.28, "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters.

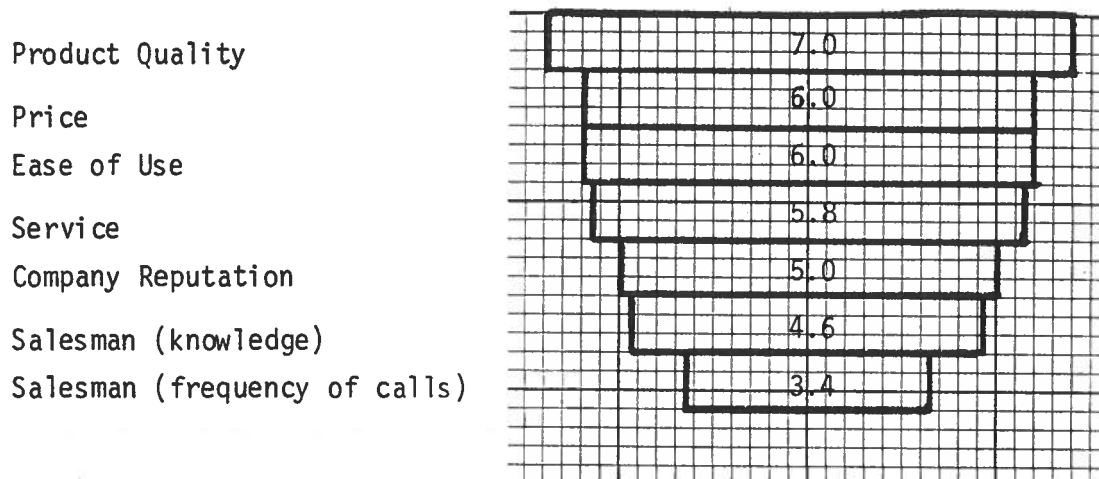
In examining the percentages in the number one ranking position, one can see that as many as 96 % of the rankings for quality are in that position. Service got the next highest number of rankings in this position, followed closely by price and ease of use, with salesman input trailing way behind. This is a similar picture to those provided by respondents in other disciplines.

TABLE 3.28  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	33	40	17	10	0	0	0	100
Price	37	37	17	3	7	0	0	100
Service (delivery)	40	33	3	17	7	0	0	100
Salesman (knowledge)	13	13	13	10	17	10	24	100
Sales (frequency of calls)	7	7	23	13	7	16	27	100
Company Reputation	23	27	23	4	13	0	10	100
Product Quality	96	4	0	0	0	0	0	100

Table 3.29, "Importance of Factors in Brand Selection - Weighted Rankings" takes into consideration all ranking positions, not only the number one position. This table gives a clearer visual impression of technicians' attitudes to the different parameters.

TABLE 3.29  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

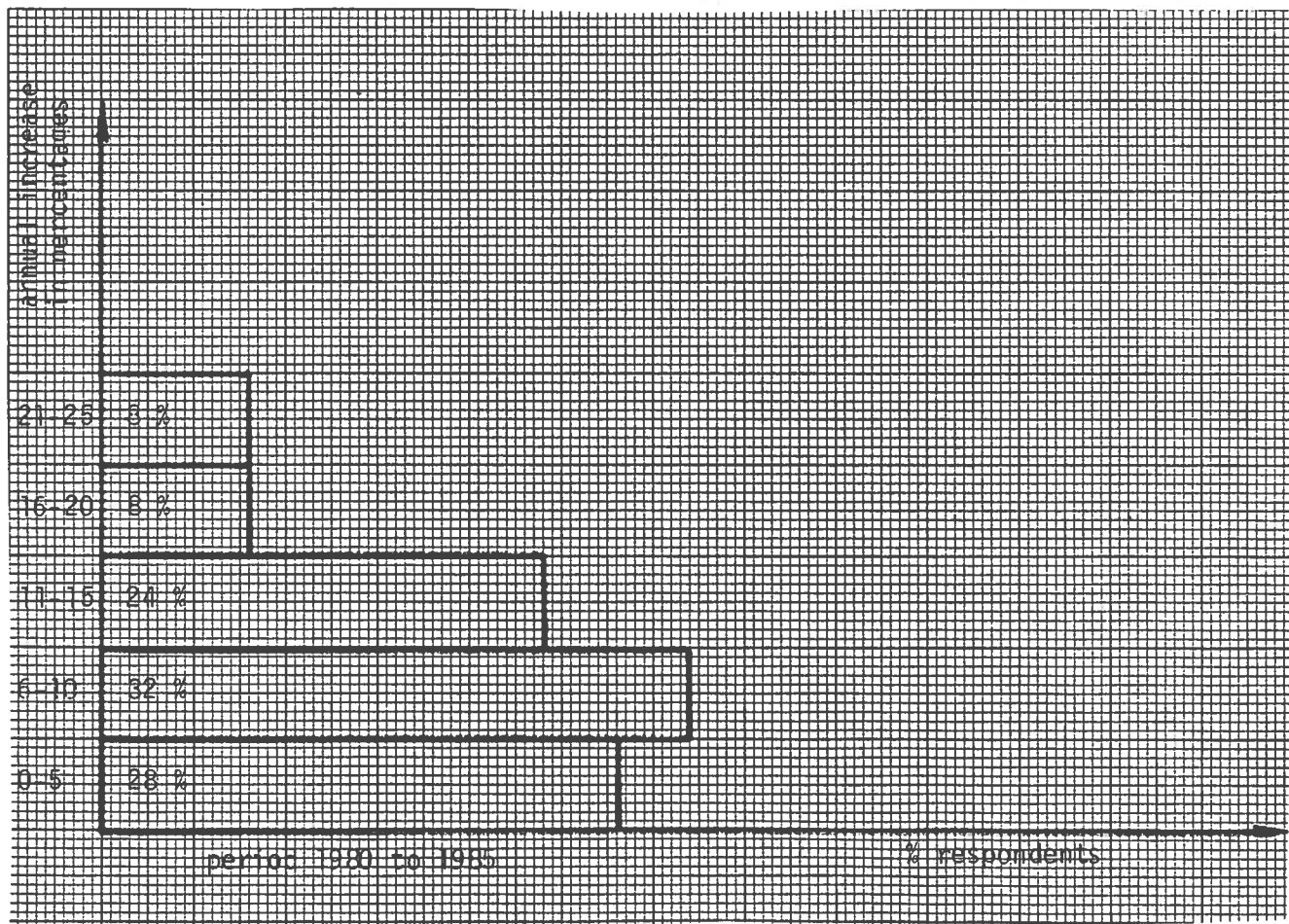


Although the effect of counting positions two to seven in Table 3.29, as well as position one, is to reduce the differences between the weights attached to the various factors, the order of ranking remains unchanged, quality still leading and salesman call frequency bringing up the rear.

3.6.6. Market Trend Estimated by End User

Table 3.30, "Market Trend Estimated by End User", shows the respondents' budget increase expectations for the next five years. 32 % of the respondents anticipate a budget increase of the order of 6 to 10 %; 28 % foresee an increase of 0 to 5 %, and 24 % an increase of 11 to 15 %. Those projecting large increases normally had individual reasons, such as an intended hospital expansion.

TABLE 3.30  
MARKET TREND ESTIMATED BY END USER



The average predicted annual increase is 9.6 %. On this basis, the hematology market would amount to \$ 12.8 million in 1985.

### 3.6.7. Desirability of Canadian-made Products by End Users

Respondents were almost overwhelmingly in favour of Canadian manufacture, 96 % being for and 4 % against.

Respondents were also asked to indicate what type of products would offer some potential for Canadian manufacturing. The following shows their responses in decreasing order of frequency.

<u>%</u>	<u>Product</u>
31 %	all hematology products
31 %	controls
18 %	reagents for automatic counters
5 %	normal and abnormal controls for multichannel instruments
5 %	isotonic diluents
5 %	stains
5 %	routine products

When those suggesting all hematology products and those suggesting routine hematology products are grouped together, a total of 36 % thought that the complete line of hematology products might be produced by Canadian firms. Also when grouping the percentages for controls, one can see that 36 % felt that hematology controls offer a good opportunity for local manufacturing.

Attitudes to Canadian as opposed to foreign firms were further investigated in the question:

"Should Canadian manufactured hematology products be available, under what circumstances would you select them over U. S. or European brands?"

Quality is still the most important factor here, with 32 % of respondents stating they would only choose a Canadian product if quality were comparable, but this factor does not loom as large as one might expect from table 3.28. Price was the next most frequently expressed concern. The complete figures obtained will be found below, in decreasing order of frequency.

<u>Criterion</u>	<u>%</u>
Comparable quality	32
Comparable price	29
Comparable service	13
Comparable availability	11
Comparable ease of use	6
Comparable company reputation	3
Comparable salesman knowledge	1
Comparable frequency of salesmens' calls	1
Comparable educational benefits	1
Better quality	4

### 3.6.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The following shows a summary of the answers received in a decreasing order of frequency.

<u>Improvement</u>	<u>%</u>
Price	42
Availability	23
Quality	15
Canadian labelling	4
Control of shipping temperature	4
Communications with company	4
Service	4
Satisfied	4

The finding on availability is consistent with the previously discussed suggestion that Canadian companies should produce the whole line of hematology products. One might be able to conclude that technicians presently find difficulty in obtaining easily the whole range of products in this field. The comment about shipping temperature might favour more locally located companies.

3.7. Immunology

3.7.1. General

The routine immunology market was extremely aggressive just a few years ago. It was one of the fastest growing segments of the diagnostic field, not only due to regular introduction of new products, but also because of the rapidly increasing number of tests requested by newly trained physicians.

The market has started to level off now. Because of budgetary restrictions, not very many new tests are introduced in hospital laboratories. In the field of tissue typing anti-sera, commercial firms have to confront the problem that the Canadian Red Cross Society supplies laboratories free of charge.

According to leading scientists in immunology, great changes will take place within ten years in pure and applied research as well as in active diagnosis and therapy. Even if the routine market does not show much increase at this stage, innovations are to be expected in the field. Since the immunology market reacts with great sensitivity to new products, it offers potential manufacturers great possibilities.

3.7.2. Total Current (1980) Canadian Market

Table 3.31, entitled "Estimated Total Immunology Market", shows that the total market can be assumed to approximate \$ 2.2 million. The stratified break-down appears below.

TABLE 3.31  
ESTIMATED TOTAL IMMUNOLOGY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	85	4
Stratum II	326	15
Stratum III	515	24
Stratum IV	412	19
Stratum V	<u>378</u>	<u>17</u>
Sub-total	1,716	79
Stratum VI	<u>459</u>	<u>21</u>
Total	2,175	100

The above table shows that 21 % of the total dollar expenditure on tests takes place in laboratories other than hospitals.

One can also see that the immunology market is relatively small compared with other areas covered by this study. Immunology expenditure is concentrated in the larger bed size hospitals, (strata III, IV and V). Small hospitals often have no immunology facilities at all; they send their tests to the larger hospitals, or, in the case of Ontario, to the private laboratories and larger hospitals.

### 3.7.3. Regional Break-down

Table 3.32, entitled "Immunology Market by Region", shows that Ontario and Quebec hold 37 % and 31 % shares of the market respectively. The market in these provinces is in the 68 % range.

TABLE 3.32  
IMMUNOLOGY MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	261	12
Prairies	348	16
Ontario	805	37
Quebec	674	31
Maritimes	<u>87</u>	<u>4</u>
Total	2,175	100

Immunology tests are more often performed in big urban centres where there is a large number of physicians, than in smaller ones.

### 3.7.4. Leading Manufacturers

Behring Diagnostics, a division of Canadian Hoechst, is predominant in the immunology field, with a share of 32 %, closely followed by I. C. N. and Hyland. There is a certain number of relatively little known local firms, such as Atlantic Antibody, Prolab and Helena.

TABLE 3.33  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Behring Diagnostics	X		
I. C. N.	X		
Hyland	X		
Cappel Laboratories		X	
Sigma		X	
Kent Laboratories			X
Meloy			X
Others			X

I. C. N. is the exclusive distributor for the Kallestad line. Prolab is a Toronto-based Canadian manufacturer, which is in other fields as well. Together with a professor from Toronto University, they produce a very small amount of antisera of the Bence Jones type.

Production of immunology reagents requires not only high technology, but also a good animal farm. Antisera to the different human proteins are produced on animals such as rabbits, horses, goats, etc.

### 3.7.5. Importance of Factors in Brand Selection

Table 3.34, entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters.

By looking at the percentages in the number one ranking position only, we can see that product quality, as usual, comes top with 92 %, followed by 59 % for service. Ease of use and price are the next most important factors, and the salesman's input, as usual, is considered of little significance.



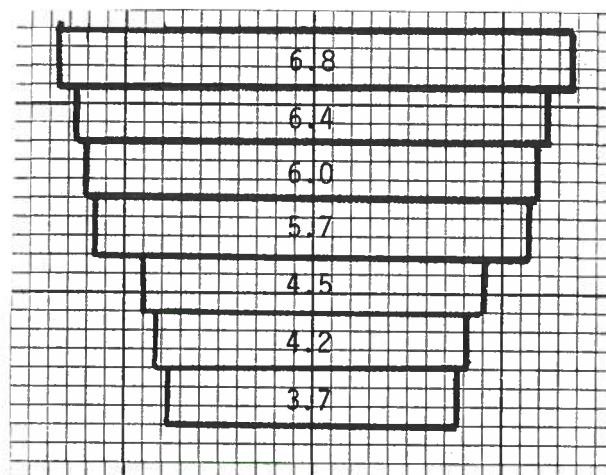
TABLE 3.34  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	43	29	9	19	0	0	0	100
Price	32	27	23	14	4	0	0	100
Service (delivery)	59	27	9	0	5	0	0	100
Salesman (knowledge)	14	9	18	23	18	14	4	100
Salesman (frequency of calls)	0	18	18	23	9	18	14	100
Company Reputation	18	9	27	18	9	14	9	100
Product Quality	92	4	0	4	0	0	0	100

Table 3.35, "Importance of Factors in Brand Selection - Weighted Rankings", takes into consideration all ranking positions, not only the number one position.

TABLE 3.35  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

Product Quality  
Service  
Ease of Use  
Price  
Company Reputation  
Salesman (knowledge)  
Salesman (frequency of calls)

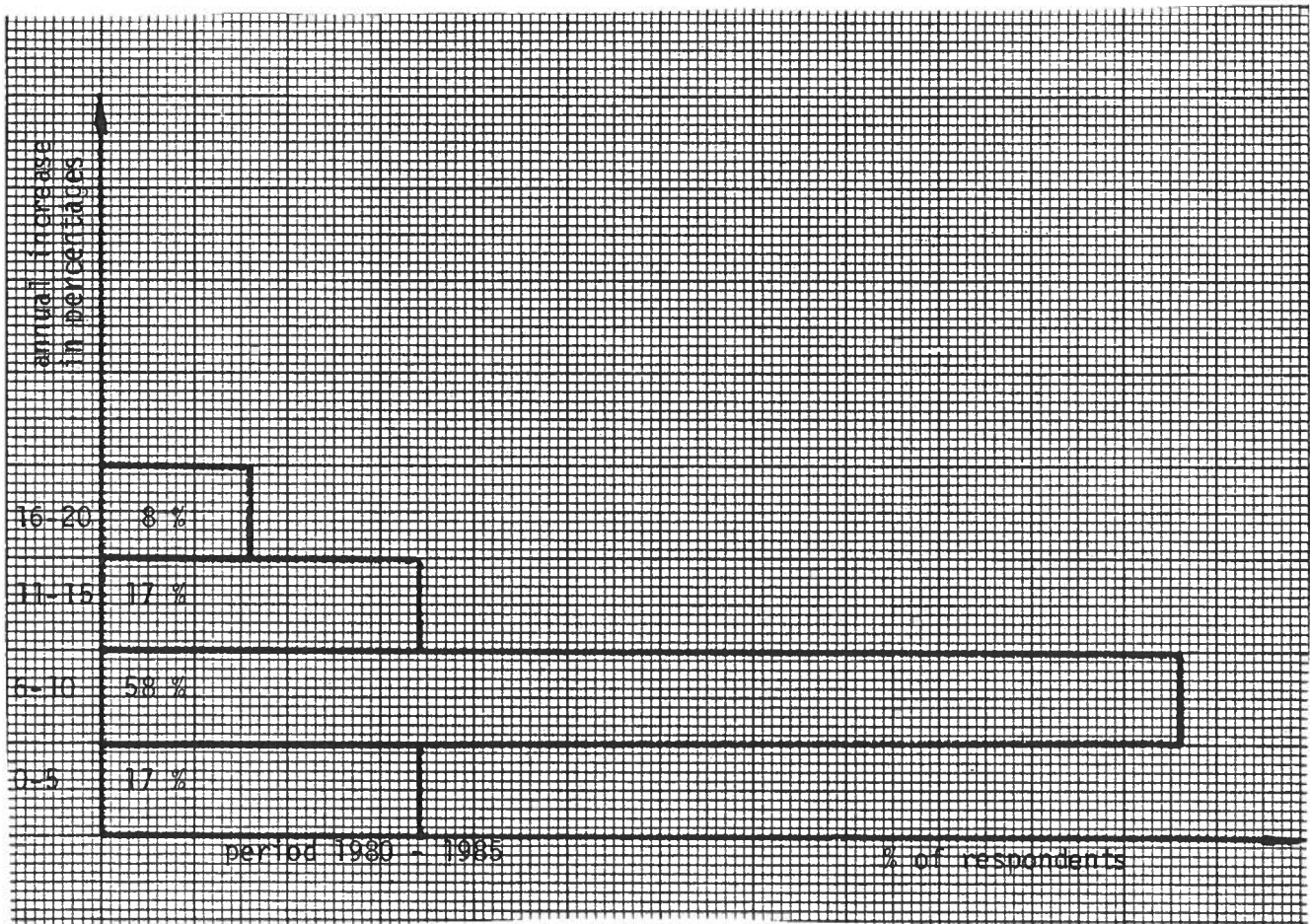


Even when all the positions are taken into account, not just position number 1, the order of preference (quality, service, ease of use, price, reputation, salesman's knowledge and frequency of salesman's calls, in decreasing order), remains the same.

3.7.6. Market Trend Estimated by End User

Table 3.36, "Market Trend Estimated by End User", shows the respondents' budget increase expectations for the next five years.

TABLE 3.36  
MARKET TREND ESTIMATED BY END USER



This graph shows that over 50 % of respondents expect budget increases of 6 to 10 % per year in the next five years, with none expecting an increase of over .20 %.

The average annual increase predicted is 9.1 %. If this prediction is fulfilled, the total immunology market will be of the order of \$ 3.4 million by the year 1985. As mentioned earlier, immunology could show a much faster increase, should, for instance, certain specific cancer tests become available.

### 3.7.7. Desirability of Canadian-made Products by End Users

92 % of respondents were in favour of Canadian manufacturing in the immunology field, whereas eight percent were opposed.

Respondents were asked also to indicate what type of products would offer some potential for Canadian manufacturing. The following shows their responses in a decreasing order of frequency:

<u>%</u>	<u>Product</u>
30 %	specific antigens and antibodies
20 %	radial immunodiffusion products
20 %	immunochemistry, immunofluorescence and ELISA
20 %	all products
10 %	ANA

Respondents were also asked:

"Should Canadian manufactured immunology products be available, under what circumstances would you select them over U. S. or European brands?"

The answers to this question are summarized below:

<u>Criterion</u>	<u>%</u>
Comparable quality	41
Comparable price	35
Comparable availability	6
Comparable service	6
Comparable ease of use	3
Comparable stability	3
Comparable expiry dates	3
Comparable quality control	3

Here, once again, it is clear that technicians are most concerned about quality. In order to compete in this market, Canadian firms would have to prove to buyers that the quality of their products was impeccable. In several different disciplines, comments have shown that certain laboratories are suspicious about the quality of Canadian diagnostic products.

3.7.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The following is a summary of answers received in a decreasing order of frequency.

<u>Improvement Desired</u>	<u>%</u>
Price	47
Availability	33
Quality	13
Satisfied	7

According to the answers tabulated above, price was in far greater need of improvement than quality (47 % and 13 %, respectively), with availability falling in between. 6 % of respondents were satisfied with present suppliers.

In comparing the attitude expressed by end users to quality, it would seem that they mostly find their present products to be of adequate quality and are wary about changing brands lest they sacrifice quality. They are prepared to pay what they consider high prices for the quality they desire, but would like to have their cake and eat it, in achieving price decreases while maintaining quality. To overcome such resistance to change, new companies in the market would have to make an all out effort to drive the quality message home.

### 3.8. Radio-immunoassay

#### 3.8.1. General

RIA is probably the most volatile market of all segments studied.

The total market does not change too much in terms of number of units purchased or number of RIA tests performed, but, due to a relatively recent price war, the dollar market shows considerable fluctuation. There are also a great many hospitals where "home brew" preparations are used. These preparations are produced by the technologists in the laboratory, but often (according to company officials interviewed) these reagents do not go through the quality control process a commercial product would be subject to before reaching the market.

RIA is less automated than biochemistry, for instance, but, in order to read the test results a gamma counter is needed. Each laboratory is therefore equipped with a counter (more or less sophisticated), which often is given out "free" to the customer. Actually, the price of the gamma counter is built into the selling price of the reagents and therefore the client is bound to buy the instrument manufacturer's product for a few years (generally three years) before the price of the gamma counter is paid for. Having instruments together with a complete line of reagents gives a considerable advantage over companies with a reagent line alone.

A laboratory must have a licence from Atomic Energy of Canada before starting up RIA work. Not all hospitals are licensed to perform such tests. Those which are not licensed usually farm out the analyses to either a provincial or a private laboratory. In Quebec they are usually sent to a larger hospital rather than to a private laboratory. (See circular from Dr. D. Lazure)

#### 3.8.2. Total Current (1980) Canadian Market

Table 3.37, entitled "Estimated Total RIA Market", shows that the 1980 expenditure in RIA reagents is of the order of \$ 9.8 million.

In this case, stratum VI also includes the Canadian Red Cross, which uses over \$ 1 million worth of HAA supplied by Abbott.

The stratified break-down is shown in the following table.

TABLE 3.37  
ESTIMATED TOTAL RIA MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	196	2
Stratum II	197	2
Stratum III	786	8
Stratum IV	1,572	16
Stratum V	<u>1,475</u>	<u>15</u>
Sub-total	4,226	43
Stratum VI	<u>5,601</u>	<u>57</u>
Total	9,827	100

This table shows that hospitals of up to 200 beds only represent 4 % of the total market.

Many of the Ontario hospitals send specimens for testing to the Ontario private laboratories, whereas in the Western provinces many hospitals use the services of the provincial laboratories.

### 3.8.3. Regional Break-down

Table 3.38, entitled "RIA Market by Region", shows that 37 % of the market is in Ontario, followed by 27 % in Quebec. These two regions represent 67 % of the total market.

TABLE 3.38  
RIA MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	1,081	11
Prairies	1,572	16
Ontario	3,636	37
Quebec	2,654	27
Maritimes	<u>884</u>	<u>9</u>
Total	9,827	100

3.8.4. Leading Manufacturers

Prices are so different from manufacturer to manufacturer that often a company which seems to be a market leader based on unit sales will fall back on a market share list based on dollars.

Abbott is strongly competing for unit penetration by cutting prices in the thyroid function test market. RIA INC., a Toronto-based local manufacturer, is trying to keep up in the price war by quoting prices similar to Abbott's or even below.

Those who have a complete line can still make a profit in hormone assays other than thyroid function.

Table 3.39, entitled "Market Share of Leading Manufacturers", shows the approximate shares of major manufacturers.

TABLE 3.39  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Abbott	X		
Bio-Ria	X		
RIA Inc.	X		
Clinical Assay		X	
N. E. N.		X	
Bio-Rad		X	
Amersham		X	
Pharmacia			X
N. M. L.			X
Micromedics			X
Becton & Dickinson			X
I. C. N.			X
Diagnostic Biochem			X

There are a great many others with a one percent share or even less. Abbott is very strong in the RIA field. Their market share can be estimated at about 30 %, followed by Bio-Ria with 14 % and RIA Inc. with 12 %. RIA Inc. sells through Ames, therefore the 12 % is a compounded figure for both RIA and Ames. Clinical Assays is a division of Hyland, which, in turn, is a division of Baxter-Travenol. N. M. L. was taken over a few years ago by Warner Lambert. Micro-medics sells through Canlab. The three Canadian companies producing RIA reagents are: RIA Inc., Bio-Ria and Diagnostic Biochem.

### 3.8.5. Importance of Factors in Brand Selection

Table 3.40, entitled "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters.

By looking at the percentages in the number one ranking position only, we can see that product quality got 95 % in that position, followed by 39 % for service.

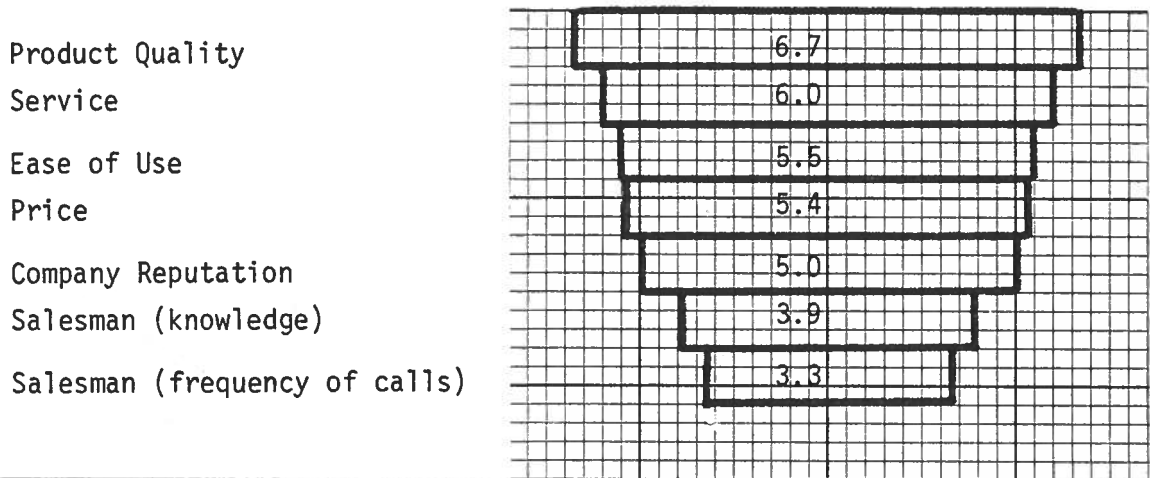
TABLE 3.40  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	22	39	17	17	0	0	5	100
Price	22	28	34	6	5	0	5	100
Service	39	44	11	0	0	0	6	100
Salesman (knowledge)	11	6	22	22	22	0	17	100
Salesman (frequency of calls)	6	5	11	28	17	5	28	100
Company Reputation	22	10	31	21	16	0	0	100
Product Quality	95	0	0	0	0	0	5	100

Table 3.41, "Importance of Factors in Brand Selection - Weighted", takes into consideration all ranking positions, not only the number one position.



TABLE 3.41  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS



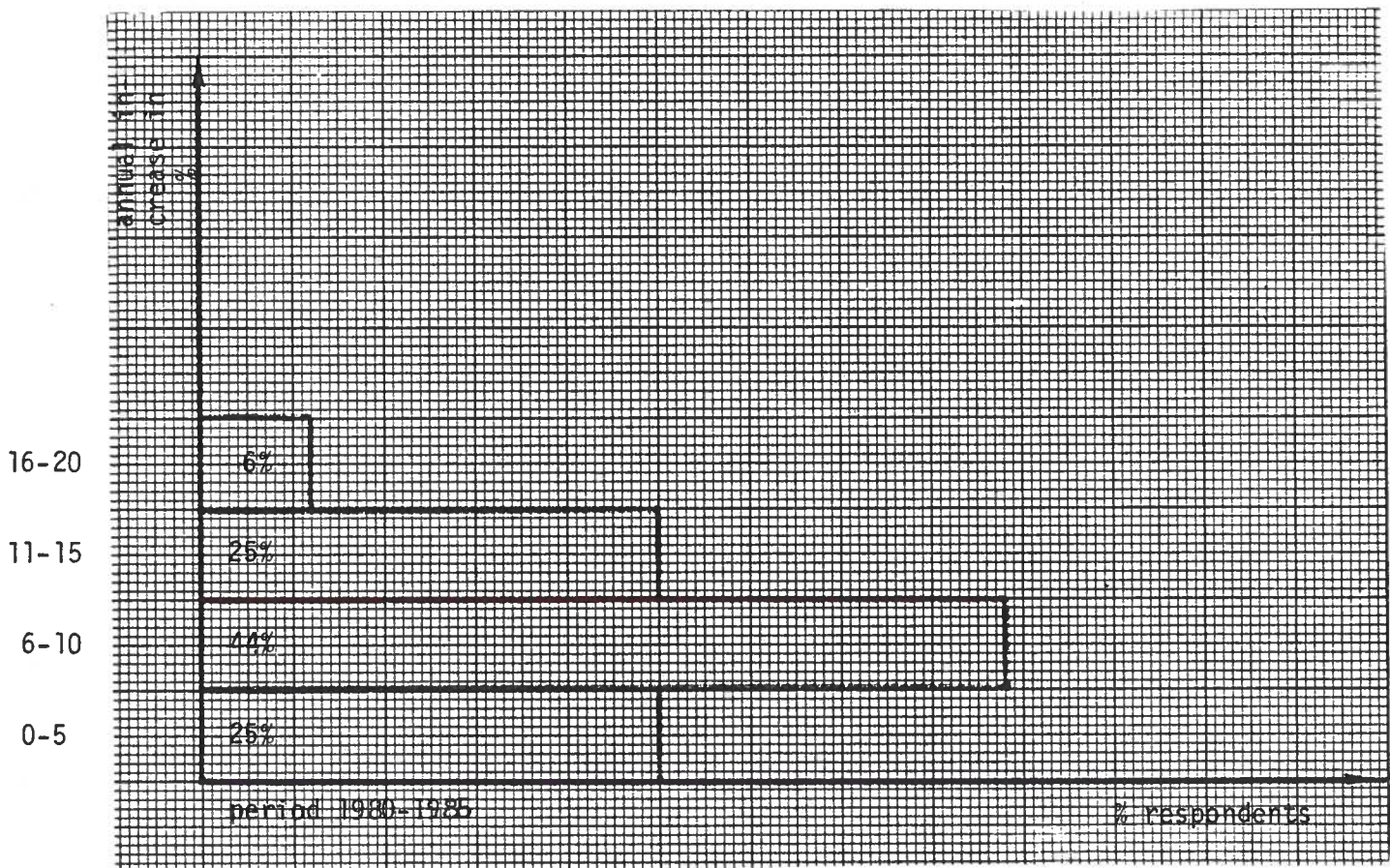
The above table shows that service is almost as important as product quality. This becomes clear when we realize the short shelf life of RIA products. Laboratories do not keep such a large stock as in other diagnostic areas and therefore require rapid delivery when unexpected need arises. Kits have to be easy to use, with a minimum of manipulation and incubation time. Price is in the fourth position. We may therefore assume, given the existence of a price war in the thyroid function test market, that companies competing for this segment will have good quality products, about the same technology, and are offering the same type of service.

Company reputation seems to be also an important factor in brand selection, which makes it difficult for new companies to enter this market.

#### 3.8.6. Market Trend Estimated by End User

Table 3.42, "Market Trend Estimated by End User", shows the respondents' budget increase expectations for the next five years.

TABLE 3.42  
MARKET TREND ESTIMATED BY END USER



The above table shows that 44 % of the respondents foresee an annual increase of 6 to 10 % in their RIA reagent budgets. Only 6 % predict a sharp increase of 16 to 20 %.

The average increase indicated by respondents is 8.1 % per annum. The RIA market will therefore reach \$ 14.5 million by 1985 if the annual increase really remains at 8.1 %.

### 3.8.7. Desirability of Canadian-made Products by End Users

About 69 % of the respondents indicated that they are in favour of Canadian manufacturing in the RIA field, as opposed to 31 % who do not see any opportunity for local production.

Respondents were also asked to indicate what type of products would offer some potential for Canadian manufacturing.

The following shows their response in a decreasing order of frequency:

33 %	thyroid function tests
18 %	all RIA products
17 %	routine products
16 %	antibodies
16 %	enzyme immunoassay

We should note that the company Syva marketed some kits for enzyme immunoassay, called EMIT, a few years ago. The advantage of this technique is that no radioactive material is used, and that it is very easy to automate. Other companies, such as Abbott, for instance, are just about to market a few enzymatic reagents which then could easily replace RIA.

In spite of the end users' recommendations, Galasco feels that entering the thyroid function market would be a high risk proposition due to the pricing policies of large multinational companies.

Respondents were also asked:

"Should Canadian manufactured RIA products be available, under what circumstances would you select them over U. S. or European brands?"

Most of the respondents would settle for a comparably priced product (27 %), the same quality (25 %), the same service (15 %), equivalent ease of use (8 %), the same availability (7 %), comparable frequency of salesmen's visits and knowledge (5 % each) and equivalent company reputation (5 %). Just 3 % indicated that they would only consider buying Canadian if the product was actually of superior quality.

This shows that Canadian manufacturers like RIA Inc. and Bio-Ria, who have both achieved excellent market penetration, have been able to demonstrate the high quality of their products and are also price competitive.

3.8.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The following shows a summary of the answers received in a decreasing order of frequency.

Price	67 %
Quality	16 %
Competition for EMIT	9 %
More technical data	8 %

This shows that, should a Canadian manufacturer be in a position to offer even better prices (in Galasco's opinion this is almost impossible), their chances of penetration would increase markedly. It is interesting to note that 9 % would like to see some competition in the enzymatic immunoassay field. This would probably force Syva's prices down.

3.9 Serology

3.9.1. General

Serology reagents often come in a kit form, the kit including the partial or the complete test systems to diagnose diseases or to monitor human conditions. Some of the tests included in serology are performed in bacteriology, while others, like pregnancy tests, are often done in biochemistry. Rubella, depending on the technique used, can be done in serology or virology.

3.9.2. Total Current (1980) Canadian Market

Table 3.43, entitled "Estimated Total Serology Market", shows that the 1980 expenditure on serology reagents totals around \$ 3.3 million.

The stratified break-down is shown in the table.

TABLE 3.43  
ESTIMATED TOTAL SEROLOGY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	354	11
Stratum II	475	14
Stratum III	622	19
Stratum IV	984	30
Stratum V	<u>419</u>	<u>13</u>
Sub-total	2,854	87
Stratum VI	<u>433</u>	<u>13</u>
Total	3,287	100

It should be noted that some of the V. D. reagents are supplied free of charge by the provincial laboratories. Pregnancy testing is often done in the doctor's office, as well as in drug stores. The total pregnancy test market is therefore considerably bigger than this report states.

### 3.9.3. Regional Break-down

Table 3.44, entitled "Serology Market by Region", shows that 34 % of the market is in Ontario and 29 % in Quebec, making a total of 63 % for these two strata.

TABLE 3.44  
SEROLOGY MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	427	13
Prairies	592	18
Ontario	1,118	34
Quebec	953	29
Maritimes	<u>197</u>	<u>6</u>
Total	3,287	100

### 3.9.4. Leading Manufacturers

Not all companies have a complete serology line. Some, like Roche, only have the pregnancy test kit, while Behring Diagnostics has most of the other products, but not the pregnancy test kit. Table 3.45, "Market Shares of Leading Manufacturers" fills in the details.

Organon has an almost complete line, with both the pregnancy test and other test reagents. In this segment of the diagnostic field, just as in bacteriology, General Diagnostics acts as exclusive distributor of the U. K. laboratory, Burroughs Wellcome. They sell the Wellcome antisera in bacteriology and the pregnancy test kit in serology.

TABLE 3.45  
MARKET SHARES OF LEADING MANUFACTURERS

IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Horner	X		
Roche	X		
Organon	X		
Behring Diagnostics		X	
Ortho		X	
Hyland		X	
General Diagnostics			X
Qualicum			X

Horner represents the Denver product line. Qualicum is the only Canadian manufacturer but it is possible that, in this case, the product they are selling is imported.

### 3.9.5. Importance of Factors in Brand Selection

Table 3.46, "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters evaluated in this study.

As always, quality is given top ranking in the number one position, but, for once, in serology, ease of use gets pride of place before price and service.

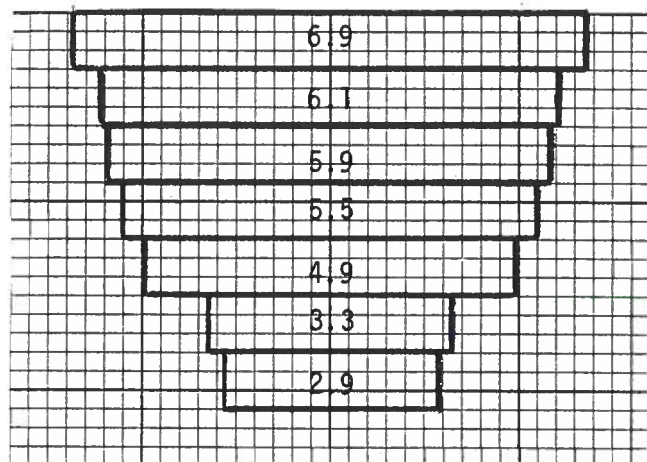
TABLE 3.46  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	36	41	5	13	0	5	0	100
Price	23	27	27	18	5	0	0	100
Service	32	55	9	4	0	0	0	100
Salesman (knowledge)	0	9	23	23	9	9	27	100
Salesman (frequency of calls)	0	0	22	27	5	7	36	100
Company Reputation	18	18	27	18	14	0	5	100
Product Quality	91	9	0	0	0	0	0	100

Table 3.47, "Importance of Factors in Brand Selection - Weighted Rankings", shows quality still in top position even when positions 2 to 7 are also taken into account, but ease of use has now been overtaken slightly by service. Salesmen are considered to be more important in serology than in other disciplines.

TABLE 3.47  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

Product Quality  
Service  
Ease of Use  
Price  
Company Reputation  
Salesman (knowledge)  
Salesman (frequency of calls)

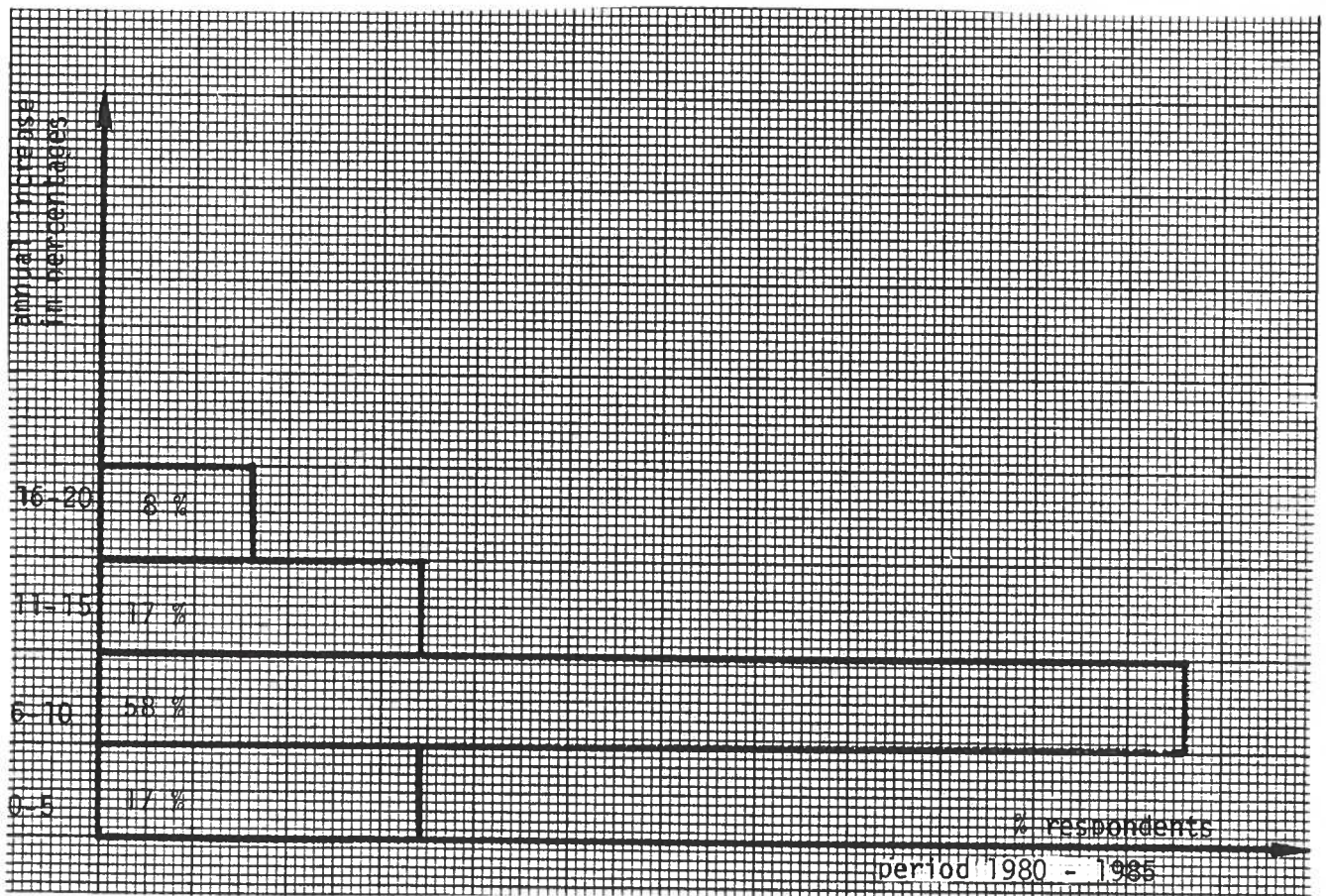




3.9.6. Market Trend Estimated by End User

Table 3.48, "Market Trend Estimated by End User", shows the respondents' annual budget increase expectations over the next five years.

TABLE 3.48  
MARKET TREND ESTIMATED BY END USER



The bulk of participants anticipate an annual increase of 6 to 10 % in their budgets during the next five years.

The average increase expected is 9.0 per annum. On the basis of this consumer estimate, we can expect a total serology market of \$ 5.0 million in 1985.

### 3.9.7. Desirability of Canadian-made Products by End Users

About 94 % of respondents are in favour of Canadian manufacturing of serology products and only 6 % are opposed.

Respondents were asked to indicate what type of products would offer opportunities for Canadian firms. Their replies can be broken down in the following manner.

<u>Product</u>	<u>%</u>
all serology products	20
infectious mononucleosis	20
A. S. O.	15
routine reagents	10
rheumatoid arthritis	10
Widal antigens and antisera	10
rubella	5
ANA (LE)	5
venereal disease products	5

Respondents were also asked:

"Should Canadian manufactured serology products be available, under what circumstances would you select them over U. S. or European brands?"

In the opinion of respondents, quality and prices are equally important criteria of brand selection, each scoring 32 %. Further details are listed below.

<u>Criterion</u>	<u>%</u>
Comparable quality	32
Comparable price	32
Comparable service	10
Comparable ease of use	7
Comparable availability	7
Comparable shelf life	3
Comparable salesman knowledge	3
Comparable company reputation	3
Better quality	3

3.9.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The answers are summarized below in decreasing order of frequency.

<u>Improvement Needed</u>	<u>%</u>
Availability	44
Quality	22
Price	17
Service	6
Satisfied	6
Canadian labelling	5

It is obvious at once that availability is causing frustration. This, coupled with the finding that a fair number of respondents feel a Canadian company should produce a whole line of products, points to the importance of new companies in this field manufacturing a wide range of serology products.

3.10. Urinalysis

3.10.1 General

The total urinalysis market is far bigger than would appear from this report. A large number of tests are performed in drug stores and in the doctor's office, but these facilities are not covered by the present survey.

Products used are called test strips, which change colour in the presence of substances to be detected in the urine. The tests are mainly qualitative, however quantitative methods as well as a certain degree of automation have also been noted in this field.

3.10.2 Total Current (1980) Canadian Market

Table 3.49, entitled "Estimated Total Urinalysis Market", shows that the 1980 expenditure in urinalysis reagents is of the order of \$ 3.8 million.

TABLE 3.49  
ESTIMATED TOTAL URINALYSIS MARKET  
\$s- IN '000s

	EXPENDITURES	%
Stratum I	284	8
Stratum II	426	11
Stratum III	938	24
Stratum IV	853	23
Stratum V	<u>342</u>	<u>9</u>
Sub-total	2,843	75
Stratum VI	<u>942</u>	<u>25</u>
Total	3,785	100

There are three peaks here, in the strata III, IV and IV.

3.10.3. Regional Break-down

Table 3.50, "Urinalysis Market by Region", shows that Ontario represents the biggest of the five regional markets studied. Ontario and Quebec have 63 % of the total test strip market, followed by 31 % for the West.

TABLE 3.50  
URINALYSIS MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	492	13
Prairies	681	18
Ontario	1,287	34
Quebec	1,098	29
Maritimes	<u>227</u>	<u>6</u>
Total	3,785	100

3.10.4. Leading Manufacturers

There are two major companies competing in the urinalysis field. The largest shares fall to Ames, followed by B. M. C. Table 3.51 below illustrates the market share pattern.

TABLE 3.51  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Ames	X		
B. M. C.	X		
B. D. H.			X
Hoechst			X

Both Ames and B. M. C. service hospital and private laboratories as well as doctors' offices and drug stores. Ames sells directly to doctors and drug stores, whereas B. M. C. uses a distributor, Arlington.

Ames is a division of Miles Laboratories.

3.10.5. Importance of Factors in Brand Selection

Table 3.52, "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the seven different parameters.

As always, quality is accorded top ranking in the number one position, followed by ease of use and price. The details appear below.

TABLE 3.52  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	52	36	9	3	0	0	0	100
Price	52	24	15	6	0	0	3	100
Service	36	46	12	6	0	0	0	100
Salesman (knowledge)	9	21	23	26	9	0	12	100
Salesman (frequency of calls)	3	9	27	31	3	12	15	100
Company Reputation	25	35	28	6	0	0	6	100
Product Quality	91	9	0	0	0	0	0	100

Table 3.53, "Importance of Factors in Brand Selection - Weighted Rankings", takes into consideration all ranking positions, not just the number one position.

TABLE 3.53  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

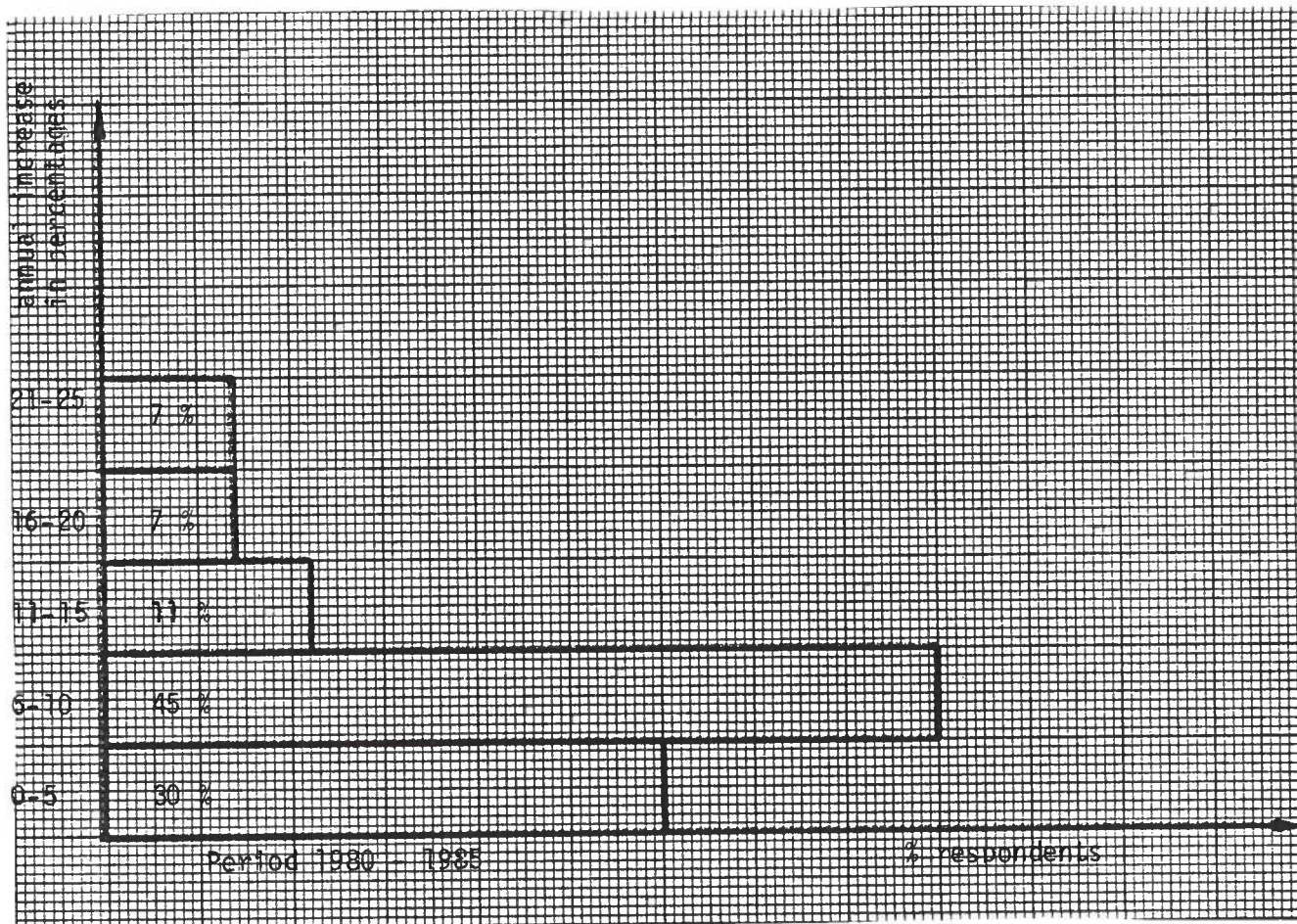
Quality	6.5
Ease of Use	6.4
Service	6.1
Price	6.1
Company Reputation	5.5
Salesman (knowledge)	4.6
Salesman (frequency of calls)	3.8

These findings bear out those of Table 3.53, namely that quality is the most important single factor. The order of the remaining criteria remains the same too, except that price has sunk very slightly below service.

3.10.6. Market Trend Estimated by End User

Table 3.54, "Market Trend Estimated by End User", shows the respondents' annual budget increase expectations for the next five years.

TABLE 3.54  
MARKET TREND ESTIMATED BY END USER



Some laboratories are expecting quite considerable expansion, in the order of 21 to 25 %, but a larger number than usual, 30 %, expected only a modest increase of 0 to 5 %. As usual, the 6 - 10 % range is chosen the most frequently, in this case by 45 % of the respondents.

The average of all the increase expectations expressed is 8.8 %. If the urinalysis business were to expand at this rate, total sales would approximate \$ 5.77 million by 1985.



### 3.10.7. Desirability of Canadian-made Products by End Users

About 79 % of respondents are in favour of Canadian manufacturing, whereas 21 % are opposed.

Respondents were also asked to indicate what type of products would offer some potential to Canadian manufacturers. The table below reproduces their answers.

<u>Product</u>	<u>%</u>
all types of urinary test strips	60
routine strips	13
controls	7
chemicals	7
new strips	7
stains	6

Urinary test strips, in general, presumably offer great marketing potential to interested Canadian manufacturers, based on the large percentage of respondents proposing them.

Participants in the survey were also asked:

"Should Canadian manufactured urinalysis products be available, under what circumstances would you select them over U. S. or European brands?"

In their answers to this question, respondents ranked quality slightly higher than price, as can be seen below.

<u>Criterion</u>	<u>%</u>
Comparable quality	39
Comparable price	32
Comparable service	7
Comparable availability	7
Comparable ease of use	5
Better price	5
Better availability	2
Better quality	2
Comparable stability	1

3.10.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

Replies received are summarized below:

<u>Improvement Needed</u>	<u>%</u>
Price	38
Quality	29
Availability	17
Satisfied	12
Instrumentation for urinalysis	4

The relatively high ranking assigned to ease of use in the brand selection section is related to the desire expressed in the above table for instrumentation. Urinalysis is at a stage where there is little automation. There is thus a crying need for an innovative company in this area.

3.11. Virology

3.11.1. General

Virology is involved in culture and identification of viruses, just as bacteriology is involved in culture and identification of bacteria. The requirements of the two types of organisms are so different that bacteriology laboratories are usually not equipped and do not generally have the know-how to do virology work.

Most of the small bed size hospitals refer their specimens to either a larger hospital or the provincial laboratory. Regional laboratories are also, in some cases, involved in virology work.

3.11.2. Total Current (1980) Canadian Market

Table 3.55, "Estimated Total Virology Market", shows that the 1980 expenditure on virology reagents is of the order of \$ 3 million.

Expenditure is concentrated in the larger hospitals because many small hospitals have no facilities for virology and send their tests to larger centres. The "Centre Hospitalier Universitaire" of Laval University, for example, does all the tests for the Quebec City region.

TABLE 3.55  
ESTIMATED TOTAL VIROLOGY MARKET  
\$s IN '000s

	EXPENDITURES	%
Stratum I	-	-
Stratum II	163	5
Stratum III	702	23
Stratum IV	589	21
Stratum V	<u>725</u>	<u>24</u>
Sub-total	2,179	73
Stratum VI	813	27
Total	2,992	100

A large part of the market is in stratum VI facilities, followed by hospitals of stratum III and up. Virology being so centralized, it is a lot easier to service this market than some of those which are more dispersed.

3.11.3. Regional Break-down

Table 3.56, entitled "Virology Market by Region", shows that the West takes up about 30 % of the market, while Ontario and Quebec represent about 63 %.

TABLE 3.56  
VIROLOGY MARKET BY REGION  
\$s IN '000s

	IN \$	IN %
British Columbia	359	12
Prairies	539	18
Ontario	1,017	34
Quebec	868	29
Maritimes	<u>209</u>	<u>7</u>
Total	2,992	100

The Maritimes, as for the other segments, represents a very small and unattractive market.

3.11.4. Leading Manufacturers

The "big three", who constantly recur when the virology market is discussed, are Flow, Connaught and Microbiological Associates, in that order, with shares of approximately 36 %, 31 % and 16 %, respectively. A good number of other companies have relatively small shares of the market.

Table 3.57 below fills in the details.

TABLE 3.57  
MARKET SHARES OF LEADING MANUFACTURERS  
IN %

	10.1 % AND MORE	5.1 - 10 %	5 % AND LESS
Flow	X		
Connaught	X		
Microbiological Associates	X		
Gibco		X	
Electronucleonics Laboratories			X
Antibodies Inc.			X
Cappel Laboratories			X
B. B. L.			X
Virgo			X
Abbott			X
General Diagnostics			X

Some of the above companies do not have a local distributor, laboratories therefore import directly from the U. S. A. to cover their needs. B. B. L. is a division of Becton and Dickinson.

### 3.11.5. Importance of Factors in Brand Selection

Table 3.58, "Importance of Factors in Brand Selection", shows the frequency distribution in percentages of the rankings given to the top seven parameters.

Quality tops the list, as usual, but service and ease of use are not as far behind as they often are, the respective percentages being 80%, 50 % and 40 %. The concern with service reflects the distance of the source of the products. Not only are delays experienced in the customs in the case of U. S. products, but the customer often has to shoulder brokerage and shipping fees.

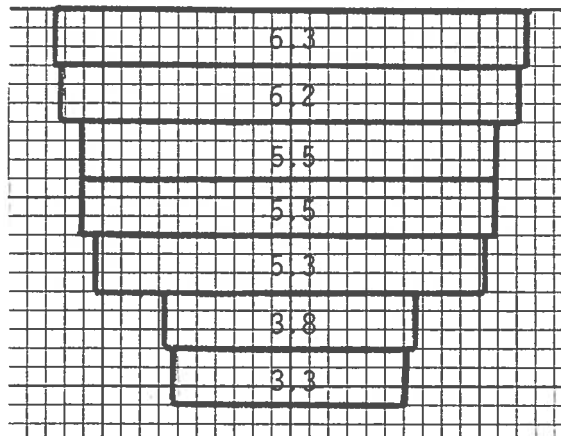
TABLE 3.58  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
FREQUENCY DISTRIBUTION IN %

PREFERENCE	1	2	3	4	5	6	7	TOTAL
Ease of Use	40	30	0	20	0	0	10	100
Price	30	20	30	10	0	0	10	100
Service	50	30	10	10	0	0	0	100
Salesman (knowledge)	0	30	0	30	10	20	10	100
Salesman (frequency of calls)	0	0	20	50	0	0	30	100
Company Reputation	30	20	30	10	10	0	0	100
Product Quality	80	10	0	0	0	0	10	100

Table 3.59, "Importance of Factors in Brand Selection - Weighted Rankings", shows the importance given to each of the seven ranking positions.

TABLE 3.59  
IMPORTANCE OF FACTORS IN BRAND SELECTION  
WEIGHTED RANKINGS

Product Quality  
Service  
Company Reputation  
Ease of Use  
Price  
Salesman (knowledge)  
Salesman (frequency of calls)



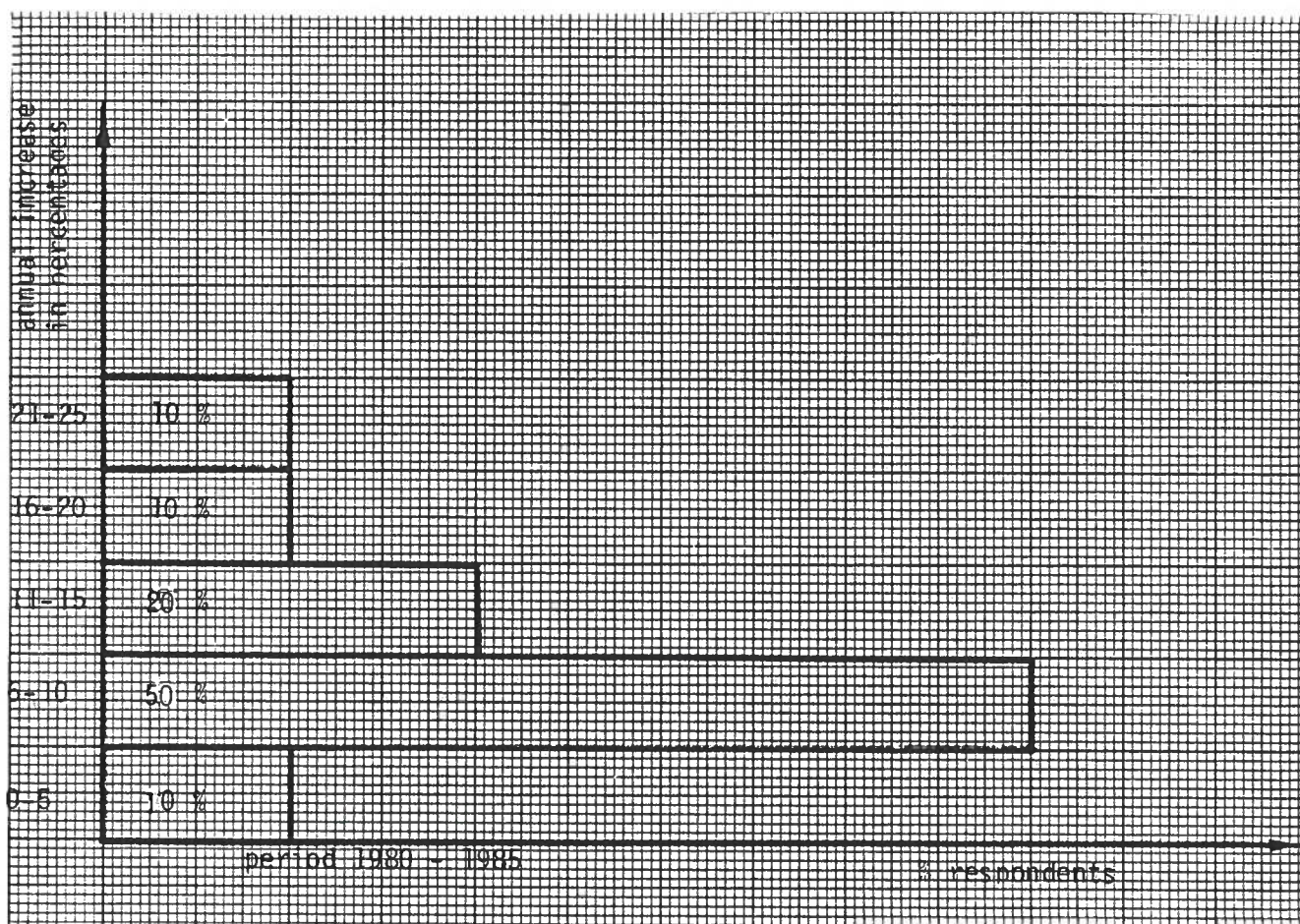
There is no significance difference in the order of choices when the criteria are weighted in this manner.

3.11.6. Market Trend Estimated by End User

Table 3.60, "Market Trend Estimated by End User", shows that half of the respondents expect an annual budgetary increase for virology reagents of the order of 6 - 10 %, followed by only 20 % expecting an increase of 11 to 15 %.

The average increase, as expressed by all respondents, can be estimated at 11.4 % for the next five years. This will bring the market from its present \$ 3 million up to \$ 5.1 million by 1985.

TABLE 3.60  
MARKET TREND ESTIMATED BY END USER



3.11.7. Desirability of Canadian-made Products by End Users

The majority of respondents (94 %) favoured Canadian manufacturing as against 7 % who opposed it.

Respondents were also asked to indicate what type of products would offer some potential for Canadian manufacturing. Their replies are set out below in order of decreasing frequency.

<u>Product</u>	<u>%</u>
antigens and antisera	38
all products	31
routine products	23
conjugated antisera	8

It is clear that most respondents (92 % when one combines the figures for antigens and antisera, all products and routine products) thought Canadian firms should be capable of manufacturing the entire virology product line.

Attitudes of end users to local and foreign companies were further examined in the question:

"Should Canadian manufactured virology products be available, under what circumstances would you select them over U. S. or European brands?"

<u>Criterion</u>	<u>%</u>
Comparable quality	40
Comparable price	28
Comparable service	8
Comparable quality control	4
Comparable availability	4
Better quality	4
Better shelf life	4
Better service	4
Better price	4

Despite responses overwhelmingly in favour of Canadian manufacturing, a fairly high number of respondents was only prepared to consider buying Canadian if the Canadian firm's products showed some improvement over existing products

3.11.8. Improvements Needed

Respondents were asked:

"Is there any area where improvements are needed?"

The following shows a summary of the answers received in a decreasing order of frequency.



<u>Improvement Needed</u>	<u>%</u>
Availability	28
Price	24
Service	24
Quality	5
Availability and quality of Canadian products	5
Availability of new products (EIA etc.)	5
Quicker and cheaper customs clearance	5
Satisfied	4

Availability seems to be the key improvement desired, as it appears in different forms three times in the table. Customs clearance problems appear in the case of U. S. imports. Price and service appear to be considered relatively satisfactory in the virology field.

### 3.12. Analysis and Conclusions

This section of the report has discussed quantitative and qualitative information for the ten disciplines under study.

Biochemistry is the biggest segment of the routine diagnostic market, representing approximately 26 % of the total, followed by Bacteriology with 17 %, RIA with 15 % and Hematology with 12 %. The others take from 3 % (Immunology) to 7 % (Blood Bank).

End-users, at the moment of brand selection, first consider product quality. Closely after quality come service (delivery) and ease of use.

It must be emphasized, however, that, in order to convey the message on quality, service and ease of use, the company must have a large sales force with excellent technical knowledge. Canadian end-users are accustomed to good quality products which give precise and reproducible results, have good stability and reasonably good shelf life. For the Canadian end-user, a good quality product often comes from a reputable company; reference is often made to large, well known firms whose products are used by influential peers and researchers whose papers are published in well read professional journals. These large companies also give workshops and lectures at conventions, distribute free samples and make sure that their brands are well introduced in medical technology training school. They give out gifts, organize parties at conventions and entertain end-users generously.

In Galasco's opinion, any newcomer to this field must make a real commitment and use a good mix of advertising and promotional techniques to back up the sales force. Marketing strategies must be carefully designed and tested, the first exposure to a new brand or new company being very important. Canadian end-users are most conservative buyers and avoid all risks when selecting a product brand. They show a great deal of brand loyalty and do not seem willing to readjust frequently to new procedures or technologies. According to some manufacturers, the brand loyalty shown by Canadian end-users and their fear that a new company's

products might be of lower quality stem from the weak medical laboratory training programs.

Newcomers in any of the ten disciplines studied will face heavy competition from the well established multinationals.

In order to achieve quick market penetration, a newcomer should offer an exclusive preparation, if possible in the fields of cardio-vascular disease, cancer or V. D. diagnosis. It is always easier to be accepted with an exclusive preparation than with an imitative one where price competition from strongly entrenched multinationals may discourage the newcomer, especially if he has limited financial resources.

If a company wishes to enter this field without offering an exclusive preparation, Galasco feels that an area should be chosen where a change in technology is about to take place. Examples are:

- in Bacteriology, where automation is finally going to have an impact,
- in RIA, where enzymatic and fluorescent techniques or even stable isotopes might be possibilities,
- in Blood Coagulation, where the chromogenic peptide assay may soon replace other well established techniques such as PTT.

The cost of market penetration will be high in this field both at the R & D stage when new products are developed and in terms of marketing and selling expenses in the case of an imitative product.

In section 3 of this report, Canadian end-users have identified products or product groups for which they feel there is an opportunity for Canadian manufacturing. It is important to note that products are presently available in all these categories, but in suggesting these areas as opportunities, the end-users believe that some products or groups are difficult to obtain, that their quality is insufficient or that improvements are needed. Some products are difficult to get, are often on back order, since domestic, i. e. mostly U. S., markets are served first, or are high priced because, being produced abroad and sold to the Canadian subsidiary, their cif includes already the manufacturer's profit, and the selling price thus has to be increased again by the amount of the subsidiary's profit, etc.

In other words, a new supplier should be in a position to either offer a new product or a new improved methodology, or else be able to offer a product of equal quality which satisfies the end-user's desire for improvements in delivery, price, etc.

If the company has no new products to offer, it may either enter the high volume/low(er) profit segments or the low volume/high(er) profit segments. In the case of RIA, for instance, price competition is very heavy in the thyroid function segment, less for other hormones and practically non-existent in HAA.

Price competition is always stronger in laboratories using a high volume of reagents than in smaller, lower volume centres.

The survey showed that, in Biochemistry, about 16 % of expenditures went for controls and standards, 45 % for automated test reagents and the remainder for semi-automated and manual testing reagents. The largest and most promising segment of the Biochemistry market is the automated reagent segment, which accounts for about \$ 7.6 million.

In Bacteriology, the largest segment is the prepared media segment, representing over 40 % of the total market. The next largest segments are estimated to be dehydrated media, hemoculture and enterobacteria identification.

It is relatively easy to start out in the prepared media field, whereas brand loyalty for dehydrated media make attempts at market penetration usually unsuccessful.

The next biggest market segment is RIA. It must be mentioned that there are laboratories still using RA reagents designed for the uptake technology and competitive protein binding. The market for these and for the new enzymatic immunoassay technique was not evaluated for this report. The total RIA reagent market is estimated at \$ 9.8 million.

Hormone assay tests and tests other than the thyroid function test represent a slightly bigger segment than the thyroid function test itself. The thyroid function test market represents approximately 34 % of the total market. Price competition is very heavy in this segment, where the average cost of reagent per test has decreased by 56 % since 1976. HAA is the most promising single product as it is used by hospital laboratories as well as by the Canadian Red Cross.

In the field of hematology reagents, the largest segment, representing about one third of the total, is estimated to be controls and standards. Coulter holds a very strong position in this market, offering both instrumentation and reagents.

Hematology, like Biochemistry, is a highly automated field. Reagents for automatic counters would certainly provide good opportunities.

In Blood Banking, the largest market segment is for antihuman globulin or Coombs serum. It accounts for about 40 % of the market, followed by 26 % for grouping and typing sera. The blood bank market is dominated by Ortho. This company has excellent representation, which makes it difficult for newcomers to rapidly succeed in the blood bank field.

Test strips used in Urinalysis are also sold to doctors. A company with such a product line must therefore be prepared to call on the doctor's office. The market is dominated by Ames. They have a strong position in laboratories, as well as in the doctor's office, and have come up with a means of automating the procedure.

Pregnancy testing is classified as serology. The test is often done in the doctor's office and in drug stores. The total market including these two facilities may well be extensive and would make pregnancy test reagents (slide and tube) the biggest single item in this field. Taking only the hospital and private laboratory markets, rubella testing alone represents approximately 40 % of the total market, followed by pregnancy testing. The actual dollar market for the conventional V. D. test reagents is quite small because provincial laboratories offer the testing to hospitals free of charge. This market segment would offer considerable potential to a company able to market a new product requiring a new technique.

In Virology, the biggest segment, which takes up more than 50 % of the market, is tissue culture cells, followed by antisera. Testing is concentrated in larger size laboratories, marketing and selling expenses being therefore considerably lower than for other reagents widely used by small laboratories too.

In Blood Coagulation, PT reagents represent about 30 % of the total market, followed by PTT and controls. General Diagnostics, a division of Warner-Lambert, holds a considerable portion of this market. They enjoy an excellent reputation for product quality and representation, and, just as in the case of Blood Banking, newcomers would certainly meet with stiff resistance by end-users opposed to a change of brand allegiance. The chromogenic peptide assay test may offer some potential at a later date.

In Immunology, the RID plate market represents more than 60 % of the total. The other products, antisera for regular IEP, fluorescent and tissue typing antisera take up the rest.

Both fluorescent and tissue typing antisera have shown an increase in usage over the past three years.

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4.0 ACTUAL CANADIAN CLIMATE OF COMPETITION AND PROSPECTS

#### 4.1. The Laboratory Reagent Industry in Canada

In this report, the laboratory reagent industry comprises companies which manufacture, import or export products which are used in diagnostics. As previously mentioned, ten major disciplines are included in this study.

The Canadian diagnostic industry is dominated by large multinational companies.

In the diagnostic area, a number of large companies, mainly foreign controlled, play a major role. However, small producers are able to compete in individual product areas.

Research and development is not a significant activity in this area. The federal government and the provincial governments share part of the research. This research is not product-oriented.

In Canada, the top 30 diagnostic companies, which share about 80 to 85 % of the market, are all subsidiaries of large, foreign-owned multinational corporations.

Most products were developed by these companies outside Canada. As a result, manufacturing activities are carried out outside Canada. "Manufacturing" in Canada is usually limited to domestic markets and to compounding and packaging imported ingredients. Canadian subsidiaries are, with few exceptions, not encouraged or permitted by the head office to assume responsibility for exports of their products and are limited to marketing in Canada. Similarly, industrial R & D allocated to Canadian subsidiaries by the parent is generally devoted to product introduction activities, with only limited new product improvement.

According to the Consultant's estimate, export of laboratory reagents represents less than 5 percent of the Canadian consumption. This relatively low performance results primarily from limitations dictated by individual parent/subsidiary relationships, and secondly from the limited Canadian production capacity compared to exports.

On the Canadian market, an extensive price and product competition prevails, accompanied by improvement in efficiency in both manufacturing and marketing. Manufacturers' prices in Canada were generally in line with those in the U. S. A. and in major European countries. In some cases, Canada is used as a dumping market by multinationals, which severely hits the Canadian manufacturer.

#### 4-2 Climate of Competition Viewed by Manufacturers

There are about 50 major reagent suppliers in the diagnostic field. In each discipline, except for radio-immunoassay, the major suppliers are all multinationals and, with the exception of Ortho, they all import from the U. S. or Europe. About 90 % of total reagent expenditure is on imported products.

Two Canadian companies in the radio-immunoassay field have been able to capture a considerable share of the market, Bio-Ria and RIA Inc. They both entered the market early in the history of its development, when the growth of test units was much faster than it is now. Bio-Ria specializes in more sophisticated tests, whereas RIA Inc. concentrates its efforts on the routine thyroid function test market and manages to compete successfully with multinationals on price.

Dominion Biologicals shows a certain amount of activity in the blood bank market, and Diagnostic Chemicals in the biochemistry market.

The "Institut Armand Frappier" has done well in bacteriology, but has limited itself mainly to prepared media for the production of which they import large quantities of dehydrated media from the U. S. A.

Multinationals feel that Canadian manufacturing of diagnostic reagents is all but impossible. The reasons they cite are listed below:

- The Canadian market is too small to support local manufacturing.
- The Canadian branch would have no authority to export.
- Investments would be prohibitive when compared to market size.
- There are no large plasmapheresis centres in Canada where blood products can be collected. Therefore the raw material would have to be imported from the U. S., Europe or the Third World.
- If the investment were to be rapidly recuperated, reagents would cost \$ 5.00 instead of \$ 0.30 per test.
- Local manufacturing of lyophilized products is too difficult because of the technology involved and the price of the equipment.

The only way for a Canadian subsidiary to manufacture locally would be for it to develop a product or complete line not offered by the parent company. Only this would enable the Canadian branch to justify the original cost, because they would have access to the export market as well as the internal market.

Some multinationals manufacture plastic containers for their reagents locally; these are often exported to the U. S. parent.

If the multinationals decided to start local production, they would go into the high volume reagent business with simple process technology or into fields where the technology shows a certain stability. Entering a segment with rapidly changing technology could not be justified as there would be no reasonable return on the investment, and anyway further investment would be needed into equipment to produce reagents according to the new technology.

It can be concluded that the bulk of the Western World's diagnostic reagents are manufactured in the U. S. A., where product standardization and quality control are closely monitored by the Food and Drug Administration (F. D. A.). Practically all diagnostic manufacturers concentrate production in one or two plants. The plant, equipment and raw materials for some of the reagents require a considerable cash outlay and technology for some of the products is complex and volatile.

Canadian manufacturers tend to remain geographically isolated. Bio-Ria and I. A. F. mainly sell in Quebec; Diagnostic Chemicals concentrates on the Maritimes and RIA Inc. is active in the Toronto private laboratory area. These firms often have good quality products but do not realize the importance of marketing and sales. They have mostly been founded and run by Ph.D.s who do not sufficiently understand marketing parameters, and often operate without any well defined marketing strategy.

They would all like to expand local manufacturing, but to do this they would need to capture a greater share of the market and operate on a nation-wide scale. Some have now indicated that they have recognized the importance of marketing and their own weakness in this field, and are now aware of the fact that the only way to increase local production would be to obtain custom manufacturing contracts. Others indicate they have the capacity to produce far more than their present output but cannot do so for lack of the necessary sales and marketing capability. It is interesting to note that RIA Inc. concentrates on the Toronto area although a high percentage of their income comes from exports to Europe and the U. S. A.

I. A. F. also is contemplating exporting to the northern and central parts of the U. S. A., but it seems this will not materialize before two years. Ortho exports some of its locally produced reagents to Europe and South America.

Half Bio-Ria's income is derived from exports to the U. S. A., 15 % from exports to Europe and 35 % from domestic sales. Half of the domestic sales are within Quebec.

Multinationals have not been too severely hit by budgetary cut-backs. Instrumentation sales may have dropped but not reagent sales. Some of them indicated that the budget reductions had slowed the company's growth rate and that there has been a severe profit erosion. Companies importing from countries with a strong currency have an even greater problem as far as profit margins are concerned.

Companies like Technicon, for instance, have escaped the negative effects of budgetary restrictions by concentrating on their industrial accounts.



Some instrumentation firms offer special deals to customers who cannot get approval for capital expenditures. They offer the instrument "free", but actually the price is built into the price of the reagents for which the customer has to sign a three year contract with the supplier. Having both reagents and instruments gives a considerable advantage to multinationals over Canadian companies which only supply reagents.

Group purchasing is affecting companies even more than budget cut-backs. It seems that product selection is made on price alone. According to a few company officials interviewed, group purchasing in the province of Quebec is not properly carried out. Companies get calls informing them of the content and prices of quotations before the official opening day. Even Quebec-based officials feel that the group purchasing system is unprofessional and that the government should not be interfering with the private sector in this way.

Another major complaint was that hospitals do not respect the group buying contract. Some companies have stopped quoting for group purchasing because the prices they are to sell the products at are far too low. Instrumentation suppliers have been affected to a smaller degree because their clients are obliged to buy from them due to the instrument sales contracts.

Companies feel that group buying is legitimate in the short term but that there will be a severe backlash in the long term. Companies will either have to decrease product quality or customer service if they want to maintain a profit margin. Canadian firms are of course the first to be hit. They can hardly quote because:

- They do not have complete product lines.
- They have to quote prices which often are hardly above cost (due to economies of scale).
- As they do not have a large product line, they cannot catch up on other products.

For example, Abbott can sell thyroid function tests at cost because they have products such as HAA on which they have a considerable mark-up.

Multinationals would probably have difficulty justifying local manufacturing even if government assistance were available. Aid would have to be substantial to make the cost/benefit ratio attractive for such companies. The only possibility would be repackaging or developing a new product. In addition, the existence of tax shelter countries makes Canada a less attractive place for manufacturing.

Local manufacturers have to face other problems:

- The attitude of the Canadian end user, who, despite the availability of Canadian products, still buys from multinationals because of habit is a handicap. End users have no understanding of the economic consequences of their buying habits.
- There is no Canadian distributor capable of selling the product lines of local manufacturers at the national level.

- Local manufacturers have no available funds to attack the national market.
- In some cases, the geographical location of the plant is a drawback.
- Because of rapid obsolescence, the average life of a product is only five years. For this reason, small manufacturers find technology overtaking them when they have only just started manufacture of a given product.
- Research and development is not widespread.
- Instrumentation is lacking.
- Multinationals go in for dumping.
- The combination of inflation, price wars, budgetary cut-backs and group purchasing has a powerful negative effect.
- Success would depend on having a complete product line.
- The lack of tariff protection helps multinationals keep prices low.
- There is no cooperation between hospital and university research centres and Canadian industry. Products developed in these centres, often using government grants, end up being manufactured by U. S. companies in the U. S. A., and Canada then imports the product!
- Due to government regulations, raw materials (human blood and organs) have to be imported from the Far East or Europe.
- The pathetic attitude of powerful Canadian end users with considerable peer influence (like Canadian Red Cross) who buy from multinationals instead of buying from a local manufacturer, who has the high quality product (HAA) well accepted on the U.S.A. market.

#### 4.3. Role of Environmental Factors in the Diagnostic Industry

For most laboratory reagents and their raw materials, the cost of research and development, initial operations, marketing and sales is so high that it cannot be justified for Canadian sales only. This means that significant growth will occur only by persuading the international companies to locate manufacturing facilities in Canada to serve world markets.

By offering long term tax holidays and other special incentives, several countries, particularly Ireland and Puerto Rico, have achieved remarkably high growth rates in manufacturing of health care products in comparison with Canada and other industrialized countries. Therefore, should a U. S. company be interested in starting up another plant, chances are high that it would choose one of these tax shelter countries.

Today, most of the large multinational pharmaceutical firms have a diagnostic division with specialized product lines. This association permits the diagnostic division to spend large amounts on R & D. For example, it seems that Abbott Diagnostics has invested about \$ 12 million in diagnostic R & D. They could only do this thanks to their association with the pharmaceutical group.

Pooling of a number of hospitals' requirements under one or more central purchasing authority is being practised to obtain benefits from quantity discounts. In selecting which of several approved products should be purchased, most public and private purchasing authorities have been using lowest cost as the sole criterion. While this does encourage price competition, it is the industry's view that the long term effect of sole source purchasing is to reduce the number of suppliers, thus reducing future product competition. According to company officials, in a few years from now there will be no more than five or six diagnostic reagent manufacturers.

Canadian manufacturers are severely hit by group purchasing. Since a large part of production is sold in Canada, they have to respect their production schedules. The loss of a large group purchasing contract leads to a disastrous situation for the small Canadian manufacturer. On the other hand, winning a large group purchasing contract requires costly reorganization of production facilities.

From the above, it can be concluded that the environmental factors responsible for the low Canadian manufacturing capacity are as follows:

- Market-related factors: - limited size of Canadian market
- Purchasing practices: - group purchasing practices favour price competition between large multinational firms but, for Canadian manufacturers, it makes maintaining production schedules difficult.
- Price is sometimes forced below cost.
- Government regulations - Raw materials are unavailable in Canada.

#### 4.4. Manufacturing Opportunities in Canada

##### 4.4.1. Identification of Approach

The diagnostic market is very segmented; the ten disciplines under study include more than a thousand products. Each product is offered by a number of manufacturers, in most cases with different features, and rapidly changing technology is characteristic of this field.

The Consultant's approach in identifying manufacturing opportunities in this study was to ask the end-users about:

- the desirability of Canadian-made products
- in the case of availability of Canadian-made products, the selection criteria over imported products
- improvements needed.

Approximately 85 to 90 % of the respondents favour diagnostic products being manufactured in Canada. They would like the Canadian manufactured products to be competitive with imported ones in all major features such as quality, price, service, availability, etc.

The answer to the third question, "Improvements Needed", identifies the weakness of the market. The comments on this question enable a potential manufacturer to assess the weakness of the market versus the strength of his own product or product lines, and enter an area where the end-users are dissatisfied with one or more aspects of the following: quality, price, service, ease of use, availability, etc.

The success of a new venture is mainly dependent on a well planned marketing strategy, and the selection of product mix. The product selection, in turn, is dependent on the internal rate of return on investment of individual products or product lines. Since the Consultant's mandate did not include the evaluation of financial return on investment, the recommendations for new manufacturing opportunities are based on the end-user's dissatisfaction with some of the aspects of the products available on the market.

Based on the size of the market, market environment, the desirability of Canadian-made products, market growth selection criteria for products and the improvements needed in each discipline included in this study, a potential manufacturer, knowing the strength and weakness of his products and the expected financial return on investments, will be in a position to identify potential opportunities.

##### 4.4.2. The Major Companies

A partial list of Canadian-owned and multinational companies active in the Canadian market can be summarized as follows:

<u>CANADIAN-OWNED COMPANIES</u>		<u>MULTINATIONAL COMPANIES</u>
Bio-Ria	Abbott	Flow
Chembiomed	American Monitor	General Diagnostics
Connaught	Amersham	Hyland
D. B. L.	Ames	I. C. N.
Diagnostic Biochem	Analytab	Microbiological Associates
D. M. E.	B. B. L.	
I. A. F.	Behring	N. E. N.
Qualicum	Bio-Rad	Organon
RIA Inc. (Starplex)	B. M. C.	Ortho
	Coulter	Pfizer
	Denver	Pharmacia
	Difco	Roche
	Fisher	S. K. I.
		Technicon
		Worthington

It is estimated that the market share ratio of Canadian-owned versus multinational companies is of the order of 15/85 %.

#### 4.4.3. Summary of Problems Encountered by Canadian-Owned Firms

Based on the interviews with Canadian-owned firms, the problems encountered by local manufacturers can be summarized as follows (as elaborated in sections 4.1, 4.2 and 4.3):

- Geographical isolation faced by Canadian firms within the country
- Lack of a national sales network (direct or indirect sales)
- Weak marketing and sales strategy
- List of products too short compared to multinationals
- Low Canadian content of the product manufactured
- No real commitment. Service rather than industry
- No instrumentation offered by Canadian firms
- Government pressures (reagent budget - Group Purchasing)
- Price war
- Dumping practices
- No tariff barrier
- No access to raw materials
- No access to original products (T<sub>3</sub>, T<sub>4</sub>, CEA, Media swab, etc.)
- Rapid technological changes

- Serious cash flow problems because of accounts receivable (hospitals - 90 - 120 days especially in Quebec)
- No industrial R&D
- End-users' attitudes

#### 4.4.4. Summary of Problems Experienced by Multinationals

Multinational firms are well established on the Canadian market with considerable market shares but with limited manufacturing capacity. Below is a summary of the reasons why they do not manufacture in Canada:

- Domestic market too small
- Branch cannot export
- Initial investment too large
- No raw material
- Company philosophy
- Competition from tax shelter countries

#### 4.4.5. Could a Canadian Industry be Created?

Considering the above problems, the question remains: Could a powerful Canadian diagnostic industry be created? The answer is "Yes" because Canada has:

- human resources
- financial resources
- technical capability
- R&D capability
- market
- aging population, which will increase the health care expenditures

#### 4.4.6. How Canadian Manufacturing Can be Promoted

As developed in the previous sections, a combination of the following factors should be considered to promote local manufacturing of diagnostic reagents by the governments and the private sector:

- tax incentives for local manufacturing
- access to raw materials
- creation of a common marketing and sales network for local and foreign representation (intensified promotion of export markets)
- education of end-users
- end to the encouragement of price wars
- creation of cooperation between university research centres and the Canadian industry
- acquiring of licences (cancer, cardio-vascular, V. D.) to manufacture exclusive products.

#### 4.5. Company Profile

The following is a partial list giving the profiles of the multinational companies.

Company Name	Location of Subsidiary's Main Office	Location of Head-Quarters	Main Field of Activity
Abbott	Montreal	U. S.	(1), (7), (10)
American Monitor	Toronto	U. S.	(1)
Amersham	Toronto	Europe	(7)
Ames	Toronto	U. S.	(7), (9)
Analytab (API)	Montreal	U. S.	(2)
B. B. L.	Toronto	U. S.	(2)
Behring	Montreal	Europe	(6), (8)
Bio-Rad	Toronto	U. S.	(7)
B. M. C.	Montreal	Europe	(1), (9)
Canlab	Toronto	U. S.	(1), (4), (5)
Coulter	Toronto	U. S.	(5)
Denver	Montreal	U. S.	(8)
Difco	-	U. S.	(2)
Fisher	Ottawa	U. S.	(1), (2), (5)
General Diagnostics	Toronto	U. S.	(4), (7), (1), (2), (3)
Hyland	Toronto	U. S.	(1), (6), (7), (8), (2), (3), (4)
I. C. N.	Montreal	U. S.	(6), (7), (1), (2), (5)
Microbiological Associates	-	U. S.	(2)
N. E. N.	Montreal	U. S.	(7)
Organon	Toronto	U. S.	(8)
Ortho	Toronto	U. S.	(3), (1), (8)
Pfizer	Montreal	U. S.	(3), (5)
Pharmacia	Montreal	Europe	(7), (1)
Roche	Montreal	Europe	(8)
S. K. I.	Toronto	U. S.	(1)
Technicon	Montreal	U. S.	(1)
Worthington	Toronto	U. S.	(1)

Biochemistry	(1)
Bacteriology	(2)
Blood Bank	(3)
Blood Coagulation	(4)
Hematology	(5)
Immunology	(6)
RIA	(7)
Serology	(8)
Urinalysis	(9)
Virology	(10)



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5.0 DEMAND PROJECTION

## 5. DEMAND PROJECTION

### 5.1 General

Based on the Consultant's mandate for the products studied in this survey, the demand had to be projected for the next five years.

#### 5.1.1 Factors Influencing Demand

Two basic factors influence future demand. These are:

- the increase and demographic structure of population, and
- the increase of per capita consumption.

First, the increase and demographic structure can be estimated with accuracy for the next five years based on the projected rate of growth of the total population (published by Statistics Canada). It is evident that the demand for health care services is function of the demographic variations, for example, old people require vast amounts of medical services.

Secondly, the per capita consumption is influenced by the increase of per capita revenue. This in turn is affected by the development of the national economy, increase in education (at revenue constant), modification of the needs, change of social structure (at revenue constant), etc. In addition to per capita consumption, health care expenditures are influenced by the changes in relative prices, methodology and consumption patterns. The weight of these factors were considered for the projection of health care expenditures.

#### 5.1.2 Methods of Projecting Demand

Future demand can be projected by two main methods.

The first is a calculation of the projected rate of growth for the products under consideration from a study of the relationship between:

- the rate of growth in the past of the products studied, and
- the rate of growth in the past of health care expenditures.

Galasco Consultants Ltd. conducted a survey, similar to the present one, in 1976. The number of tests performed by the laboratories in 1976 will be the basis for the interpretation of historical data.

The second method of demand projection is a determination of the probable future demand based on a survey among end users and major manufacturers.

Finally, the Consultant will reconcile the results of the different methods and based on the:

- correlation analysis between the health care expenditures and demand for laboratory reagents
- results of the survey among end users
- results of the survey among key manufacturers, and the
- discussions with leading practitioners and scientists,

a projection will be made for the next five years for the products considered, which will reflect the consultant's opinion, and should be the main guidance for projected rate of growth.

## 5.2 Projection of Demand based on Health Care Expenditures

### 5.2.1 General

This section is essentially based on the assumption that there is a close relationship between the rate of growth of health expenditures and the rate of growth of the demand for product lines under consideration.

### 5.2.2 Historical Trends

Table 5.1 shows the health care expenditure by category as a percentage of the gross national product (GNP), 1960-1975. Between 1960 and 1970, the total health care cost, as a percentage of GNP, rose from 5.6 percent to 7.1 percent, reflecting in part, the extension of health care services to those who could not previously afford them. From 1970 to 1976, health care costs, as a proportion of GNP, levelled off; this proportion was 7.1 percent of GNP in 1975, and about 6.8 percent in 1976.

TABLE 5.1  
HEALTH CARE EXPENDITURE BY CATEGORY  
AS A PERCENTAGE OF GNP \*

	YEARS							
	1960	1965	1970	1971	1972	1973	1974	1975
Total Health Expenditures (private and public)	5.62	6.07	7.10	7.36	7.19	6.84	6.73	7.12
Personal Health Care	4.62	5.11	6.15	6.37	6.28	5.97	5.84	6.22
Institutional Care	2.47	2.90	3.61	3.69	3.64	3.50	3.55	3.84
Professional Services	1.34	1.39	1.63	1.76	1.76	1.64	1.54	1.61
Drugs and Appliances	0.81	0.82	0.91	0.92	0.88	0.83	0.75	0.77
Other Health Expenditures	1.00	0.96	0.94	0.99	0.92	0.88	0.88	0.89

Note:

\* Current dollar basis

Source: Economic Council of Canada discussion paper No. 123

This means that health care costs over this seven year period did not increase at a greater rate than the economy's capacity to pay these costs. Table 5.2 shows the government's health expenditure (in \$ 000 000) and as a percentage of budget, and Table 5.3, the source of funds for total expenditure.

While the government's share in total health expenditures rose from 43 percent in 1960, to 75 percent in 1975, and while the proportion of health expenditures in government budgets also increased, it can be noticed that this latter proportion, which was 13.5 percent in 1972 has been decreasing slowly but continuously to 12.4 percent in 1975. It would appear that the considerable involvement of governments in the health care area has led, once established, to an excessive growth in the budgetary allocations in this area.

TABLE 5.2  
GOVERNMENTS' HEALTH EXPENDITURES  
IN MILLIONS OF DOLLARS AND AS A PERCENTAGE OF BUDGET

	Federal		Provincial		Local		Total of Three Levels	
	\$ millions	%	\$ millions	%	\$ millions	%	\$ millions	%
1965-1966	486	5.6	1,529	23.2	235	5.2	1,677	10.1
1966-1967	516	5.3	1,839	23.3	259	4.8	1,995	10.3
1967-1968	622	5.5	2,192	23.5	261	4.3	2,325	10.5
1968-1969	751	6.0	2,558	24.0	319	4.7	2,713	10.9
1969-1970	1,037	7.5	3,243	26.0	399	5.3	3,474	12.4
1970-1971	1,308	8.3	3,979	26.8	455	5.5	4,262	13.5
1971-1972	1,603	8.8	4,622	26.7	466	4.9	4,886	13.5
1972-1973	1,789	8.6	5,200	27.3	503	4.9	5,478	13.4
1973-1974	1,951	8.0	5,792	26.3	538	4.8	6,069	12.9
1974-1975	2,296	7.4	7,054	25.2	590	4.4	7,357	12.4

Source: Economic Council of Canada, discussion paper No. 123

TABLE 5.3  
SOURCES OF FUNDS FOR TOTAL HEALTH EXPENDITURES

	IN %							
	1960	1965	1970	1971	1972	1973	1974	1975
Private	57	49	31	28	27	27	26	25
Public	43	51	69	72	73	73	74	75
Federal	16	20	29	31	31	31	32	32
Provincial	24	29	39	40	41	41	41	42
Local	3	2	1	1	2	1	1	1
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: Economic Council of Canada, discussion paper No. 123

### 5.2.3 Projection of Future Trends

#### 5.2.3.1 General

With the establishment of hospital and medical care insurance programs, health expenditures in Canada increased substantially, but slowed considerably since 1970. This suggests that further trends in health expenditures should be based upon different parameters than those responsible for the previous expenditure increase. This approach seems reasonable as new programs of a magnitude comparable to those that already exist are unlikely to be introduced.

Under the medical care and hospital insurance programs, it is assumed that the evolution of demographic structure of the population and other factors, such as changes in relative prices, technology, consumption patterns of health services, etc. will influence future health care expenditures, hence demand for laboratory reagents.

The choice of emphasis on the demographic aspect can be justified for the following reasons:

- (i) Market mechanisms, mainly because of government intervention, have been considerably reduced in the health services sector. Hence, usual demand and supply models can be excluded.
- (ii) Consumption of health services is related to physiological condition which largely reflects the demographic structure of the population. In particular, old people consume an extensive amount of health services.
- (iii) Demographic projections are already available and the impact of demographic change on consumption of health services under the medical care and hospital insurance programs can be gauged.
- (iv) Finally, the Canadian population is aging quite rapidly, which means that estimates of the impact of demographic changes on consumption of health services under the medical care and hospital insurance programs are particularly relevant at this time.

#### 5.2.3.2 Expected Demographic Changes

##### 5.2.3.2.1 Life Expectancy at Birth

Between 1931 and 1971, life expectancy at birth increased by 9.3 years for males, and 14.3 years for females, as shown on Table 5.4 Life Expectancy at Birth, actual and projected. According to Statistics Canada, it should increase by about one year for males between 1971 and 1986 (reaching 70.2 years in 1986) and by two years for females (reaching 78.4 years in 1986).

TABLE 5-4  
LIFE EXPECTANCY AT BIRTH, ACTUAL AND PROJECTED

	1931	1941	1951	1956	1961	1966	1971	1976	1986	2001
Males	60.0	63.0	66.3	67.6	68.4	68.7	69.3	69.7	70.2	72.8
Females	62.1	66.3	70.8	72.9	74.2	75.2	76.4	76.9	78.4	79.1
Difference	2.1	3.3	4.5	5.3	5.8	6.5	7.1	7.2	8.2	6.3

Sources: Statistics Canada, Catalogue Nos. 84-206, 91-514 and 91-516.

Future improvements are expected to affect less infant mortality than mortality at other ages. While, according to the assumptions, the decline in mortality after 1986 will lead to an older population, the most important effect will be to increase the absolute size of the population, and particularly the number of older people.

#### 5.2.3.2.2 Total Fertility Rate

Fertility in developed countries has been characterized by a steady decline since the beginning of the sixties. As far as the future is concerned, three hypotheses have been considered by Statistics Canada, two of which (the low and medium) will be retained in this study. In the first one, it is assumed that the total fertility rate will continue its decline up to 1981 and stabilize at that level, (as shown in table 5-5, Total Fertility Rate, actual and projected).

In the second one, it is assumed that the decline will stop and that the total fertility rate will increase again, reaching 2.2 births per woman in 1981, and remain at that level thereafter.

TABLE 5.5  
TOTAL FERTILITY RATE, ACTUAL AND PROJECTED  
(BIRTHS PER WOMAN)

1961	1966	1971	1976	1981	2031
3.857	2.826	2.19	1.85	Low 1.8	1.8
				Medium 2.2	2.2

Source: Statistics Canada, Catalogue No. 91-514.

With fertility at a much lower level than it was in the past, the population will become gradually older.

#### 5.2.3.2.3 Internal Migration

Immigrants, on the average, are younger than the rest of the population; the effect of that will be to reduce aging of the population. From the projections of Statistics Canada, two will be used in this study. It will be assumed that net annual migration will be respectively, 60,000 persons and 100,000 persons, for all the years of projections.

#### 5.2.3.3 Demographic Scenarios selected for the Projections

Different combinations of assumptions about the components of demographic growth can be chosen in order to produce a variety of demographic scenarios. In order to reflect a reasonable range of possible population growth, two basic demographic scenarios will be used in the remainder of this study to derive projections of health expenditure under the medical care and hospital insurance programs.

In the case of low growth scenario, the total fertility rate is assumed to stabilize at 1.8 births per woman from 1981 to 1986, according to the low assumption of Table 5.5 above. For all the years between 1972 and 1986, net immigration is 60,000 persons per year.

In the case of high growth scenario, the total fertility rate is assumed to stabilize at 2.2 births per woman from 1981 to 1986, according to the medium assumption of Table 5.5. For all years between 1972 and 1986, net immigration is 100,000 persons per year.



## 5.2.3.4 The Importance of Aging

Using these scenarios, the magnitude of the aging phenomenon can be measured. In both scenarios, the number of persons aged 65 and more will grow at a much faster rate than the total population (Table 5.6). The growth of the aged will be quite substantial from now until 1991.

TABLE 5.6  
PERCENTAGE GROWTH RATE OF CANADIAN POPULATION  
BY AGE GROUP, 10 YEAR PERIODS

DEMOGRAPHIC SCENARIOS	1971-1981	1981-1991
Low Growth		
0 - 19	-9.6	-2.2
20 - 64	24.3	14.4
65 and more	29.2	28.2
Total:	11.3	10.4
High Growth		
0 - 19	-6.6	10.9
20 - 64	26.5	16.4
65 and more	29.8	28.9
Total:	13.8	15.8

Source: Statistics Canada, Catalogue No. 91-514, special projections and estimates.

Looking at the same phenomenon from another angle, the proportion of the total population aged 65 years and more will increase continuously (Table 5.7). While in 1976 this proportion was 8.6 percent, it will be about 10 percent in 1986.

In terms of absolute numbers, there were about 2.0 million persons 65 years of age and more in 1976. There will be about 2.5 million in 1986.

TABLE 5.7  
PERCENTAGE OF POPULATION AGED 65 YEARS AND MORE

DEMOGRAPHIC SCENARIOS	1976	1981	1986
Low Growth	8.6	9.4	10.0
High Growth	8.6	9.2	9.6

Source: Statistics Canada, special projections and estimates.

#### 5.2.3.5 The Basis of Projections of Health Expenditures

##### 5.2.3.5.1 Demographic Changes and Consumption of Health Services

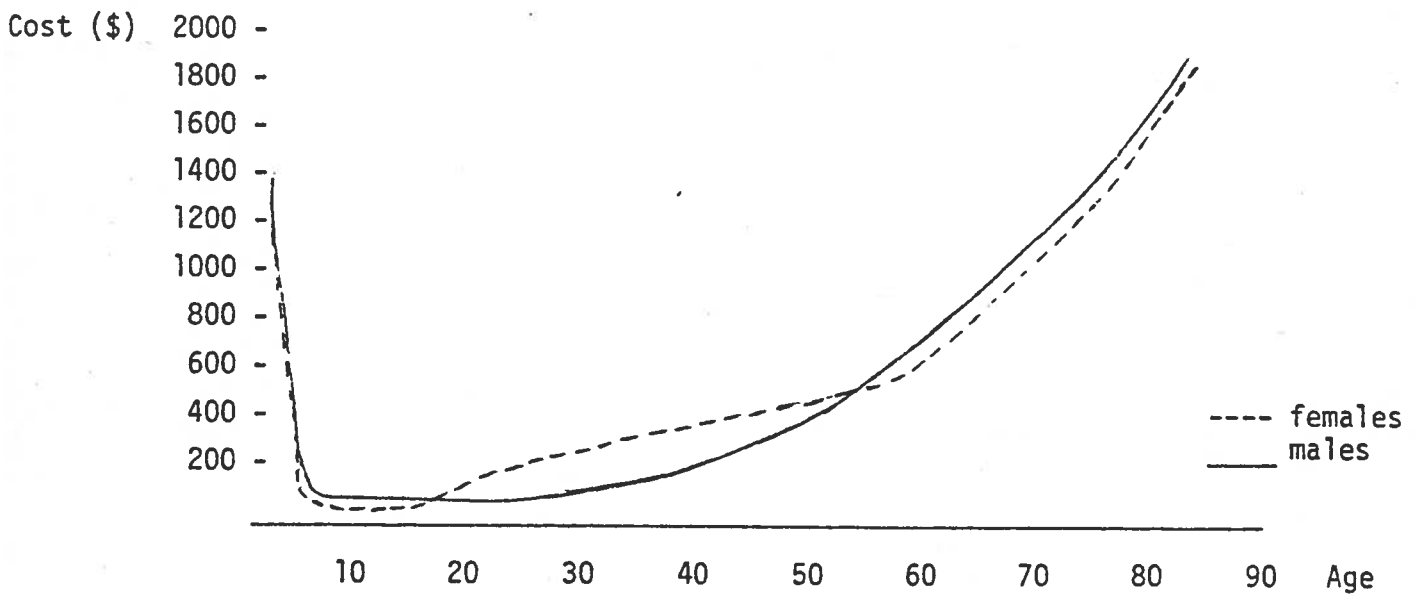
Demographic changes will have an impact on costs of government-insured health services to the extent that the amount of services required to keep a person in good health varies with age. It has been shown that the relationship between cost of health services on one hand, and age and sex on the other hand, can be represented by an asymmetric U-shaped curve.

Usually the first year after birth, costs are very high but decrease rapidly with age up to about age 15. After that age, they start growing again, and do so at a particularly increasing rate for females during the child-bearing years. Costs remain higher for females than for males for a number of years beyond the child-bearing years, but for old people, costs tend to be higher for males than for females.

This shows clearly that, if the distribution of costs by age and sex remains the same, expected future aging of the Canadian population will have important consequences on health expenditures. The purpose of the basis of projection that follows is to evaluate the impact of this relationship with respect to the medical care and hospital insurance programs.

Table 5.8 shows the adjusted annual per capita cost of government insured health services, by age and sex in 1974.

TABLE 5.8  
ADJUSTED ANNUAL PER CAPITA COST OF  
GOVERNMENT-INSURED HEALTH SERVICES  
BY AGE AND SEX  
IN 1974



5.2.3.5.2 Assumptions

In order to project demographic changes and future health care expenditures, the following assumptions should be stated.

Firstly, on the demand side, it is assumed that:

- the demand for government-insured health services by consumers is a function of physiological conditions only, and that the latter, at the aggregate level, are determined by the age and sex structure of the population,
- the average level of consumption for an individual in a particular age-sex group, will remain the same (as presently) over the period under consideration.
- the possibility that demand will be influenced significantly by variables, such as income, or relative prices, are excluded.

Secondly, on the supply side, it is assumed that consumption of health services will be determined only by demand considerations and that supply will follow demand, whatever its level.

Thirdly, it is assumed that prices, relating health services to the rest of the economy, will remain constant.

Finally, it is assumed that technological progress will not modify consumption patterns.

In accordance with the above assumption, two types of health services will be considered:

- physician's services
- public, general, and allied special hospitals (PGAS).

The expenditures for these services are largely covered by medical care and hospital insurance programs. They represent a very large portion of these programs.

Table 5.8 presents the adjusted per capita costs of government-insured health services by age and sex that were used for the projections. The same pattern can be observed as was noted before, i.e. costs are very high during the first year after birth, then decrease to a low level, and finally increase with age. The adjustment for pregnancy had the effect to make the patterns more similar for men and women.

#### 5.2.3.6 Projections of Government-Insured Health Expenditures

The adjusted annual per capita cost of health services and consideration of demographic shift are applied to project government insured health expenditures (proxied by projections of expenditures on physicians' services and PGAS hospitals).

It is assumed that prices and consumption patterns will remain constant. With these assumptions one is able to isolate the effect of demographic changes, such as population size and age structure.

The results of the projections are summarized in Tables 5.9 and 5.10 for low and high demographic scenarios respectively. Since high demographic growth will produce a larger population than low demographic growth, total health expenditures for physicians' and PGAS hospitals' services will also tend to be increased in the former scenario than in the latter. However low demographic growth involves an older age structure and consequently higher average per capita costs for these services. For instance, the per capita cost, which was \$249 in 1976 (in 1974 dollars), would increase under this scenario to \$258 in 1981 and to \$267 in 1986, while under the high growth scenario, it would be \$260 in 1981 and \$266 in 1986.

This latter result is of course due to the fact that old people will represent a higher proportion of the population in the low growth scenario. As can be seen in the bottom line of Table 5.9 these people could account for a very large proportion of government-insured health expenditures in the future. While in 1976 people 65 years old and older represented 8.6 percent of the population, and accounted for about 14.5 percent of expenditures on physicians' services and for 37 percent of expenditures on (PGAS) hospitals, in 1981, under the low growth assumption, they will account for 9.4 percent of the total population, 15.3 percent of physicians' services' expenditures and for 38 percent of PGAS hospitals' expenditures. Thus, it can be seen that aging of population will have a much larger impact on PGAS hospitals' expenditures than on physicians' services' expenditures. By 1986 people 65 years old and older could account for as much as 40 percent of PGAS hospitals' expenditures. The impact is still significant under the high growth scenario, where the percentages are only slightly lower than under the low growth scenario. From those figures, the importance of considering more efficient and less expensive care for the aged, can be seen.

This picture can be completed by analyzing the average annual rates of change of total population, government-insured health expenditures, and per capita government-insured health expenditures. This analysis is useful because it allows us to look more closely at the nature of the changes projected.

In other words, the percentage increase in government-insured health expenditures is equal to the sum of the percentage increase in expenditure per capita and the percentage increase in total population. With the help of this last equation, the increase in these health expenditures can be broken down into two components: one reflecting the increase in population size and the other, the changes in the age composition of that population.

TABLE 5-9  
PROJECTIONS OF GOVERNMENT-INSURED HEALTH EXPENDITURES,  
LOW DEMOGRAPHIC GROWTH, 1974 PRICES

	1976	1981	1986
Population (000)	22,752.2	24,014.1	25,324.4
<u>Total cost (\$ millions) *</u>			
Physicians' services	1,713.9	1,859.2	1,997.6
Hospital services **	3,954.3	4,346.2	4,756.7
Total	5,668.2	6,205.4	6,754.3
<u>Per capita cost (\$)</u>			
Physicians' services	75.33	77.42	78.88
Hospital services	173.80	180.99	187.83
Total	249.13	258.41	266.71
<u>Distribution of total cost (%)</u>			
Physicians' services	30.2	30.0	29.6
Hospital services	69.8	70.0	70.4
<u>Percentage imputable to persons aged 65 and more (%)</u>			
Population	8.6	9.4	10.0
Physicians' services	14.5	15.3	16.0
Hospital services	36.6	38.0	39.6

\* These costs can be considered as a proxy for the expenditures under the medical care and hospital insurance programs.

\*\* For public, general, and allied special hospitals.

Source: Statistics Canada and estimates.

TABLE 5.10  
PROJECTIONS OF GOVERNMENT-INSURED HEALTH EXPENDITURES,  
HIGH DEMOGRAPHIC GROWTH, 1974 PRICES

	1976	1981	1986
Population (000)	22,917.9	24,550.0	26,529.3
<u>Total cost (\$ millions)*</u>			
Physicians' services	1,725.8	1,913.0	2,099.4
Hospital services **	3,974.7	4,456.8	4,960.9
Total	5,700.5	6,369.8	7,060.3
<u>Per capita cost (\$)</u>			
Physicians' services	75.31	77.97	79.14
Hospital services	173.43	181.65	187.00
Total	248.74	259.62	266.14
<u>Distribution of total cost (%)</u>			
Physicians' services	30.3	30.0	29.7
Hospital services	69.7	70.0	70.3
<u>Percentage imputable to persons aged 65 and more (%)</u>			
Population	8.6	9.2	9.6
Physicians' services	14.4	14.9	15.4
Hospital services	36.5	37.2	38.3

\* These costs can be considered as a proxy for the expenditures under the medical care and hospital insurance programs.

\*\* For public, general, and allied special hospitals.

Source: Statistics Canada and estimates.

The results of this operation are presented in Table 5.11. In the low growth assumption, government-insured health expenditures will increase between 1976 and 1981 at an average annual rate of 1.82 percent, of which 1.08 percent will be due to increase in population size and 0.73 percent will be due to changes in the age structure. When the growth rates are taken over the whole period 1976 to 1986, it can be noticed that changes in the age structure become more important, explaining 0.68 out of 1.76 percent average annual increase.

A different pattern can be observed in the case of the high growth scenario. Between 1976 and 1981, government-insured health expenditures grow at a rate of 2.24 percent annually, but 1.37 percent of it is due to the increase in population size and only 0.85 percent is attributed to changes in the age structure. The same behaviour is observed when growth rates are taken from 1976 to 1986.

TABLE 5-11  
AVERAGE ANNUAL GROWTH RATE OF GOVERNMENT-INSURED HEALTH EXPENDITURES,  
BROKEN DOWN BY COMPONENT, BASIC DEMOGRAPHIC SCENARIOS

	<u>LOW GROWTH</u>		<u>HIGH GROWTH</u>	
	1976-1981	1981-1986	1976-1981	1981-1986
	(percentages)			
Population	1.08	1.06	1.37	1.57
Physicians' services				
Per capita expenditures	0.54	0.37	0.69	0.29
Total expenditures	1.63	1.44	2.08	1.87
Hospital services *				
Per capita expenditures	0.81	0.74	0.93	0.58
Total expenditures	1.90	1.82	2.31	2.16
Total				
Per capita expenditures	0.73	0.63	0.85	0.49
Total expenditures	1.82	1.70	2.24	2.07

\* For public, general and allied special hospitals.

Source: Statistics Canada.



Thus, whatever demographic scenario is employed, health expenditures will grow. However, the reasons for the growth may differ notably. Table 5.11 also shows that growth rates in government-insured health expenditures will be, between now and 1986, a little below 2 percent in the low growth scenario and a little above 2 percent in the high growth scenario.

#### 5.2.3.7 Impact of Parameters on Base Cases

##### 5.2.3.7.1 Impact of Alternative Demographic Scenarios

The major factor that affects the age structure of the population is fertility. Reasonable changes in life expectancy would affect only slightly components contributing to increased government-insured health expenditures. Changes in immigration would have a relatively small impact on the age structure component, but would significantly affect the population component.

##### 5.2.3.7.2 Impact of Changes in Consumption Patterns

So far, it has been assumed that age and sex specific consumption patterns of government-insured health services would remain the same during the projection period. It will be assumed that some action is taken by governments in order to realize some savings in the hospital sector.

In this scenario, it will be assumed that, from now to 1986, length of stay in hospitals will be reduced by 10 percent for people aged less than 65 years and by 20 percent for people aged 65 years or more. It is further assumed that half of this reduction will occur by 1981, the other half by 1986.

If it is possible to reduce length of stay in hospitals, this will help significantly to compensate for the effect of the growth and changing age structure of the population on government-insured health expenditures.

##### 5.2.3.7.3 Impact of Changes in Relative Prices

To evaluate the real costs of government-insured health services and of the share of those services in the GNP, relative price variation must be considered. A method will be provided for estimating the relationship between changes in prices and changes in the share of government-insured health care as a percentage of GNP.

In practice, it is difficult to accurately measure relative price changes in the health services sector because of variation in the quality of service. With that reservation in mind, it is clear that prices of health services have increased in the past much faster than the general prices. If relative health prices continue to rise at the same rate in the future, the share of government-insured health expenditures as a percentage of GNP will increase. However, the relative price rise that has been experienced in the past can be partly attributed to the substantial intervention of governments in that sector during that period.

Further, it was previously noticed that the effects of that intervention considerably softened over the recent years. If there is no further intervention, as might be expected given the present economic and social climate, then prices of health services should increase at a much slower rate than they did before and the share of government-insured health care as a percentage of GNP could remain stable, or could even decrease.

#### 5.2.4. Conclusion

##### Evaluation of Margin of Flexibility Resulting From the Projections

A number of projections of government-insured health expenditures have been presented based on different assumptions about the factors influencing their growth. To conclude it might be useful, for the purpose of policy interest, to distinguish between the factors that are controllable and those that are not.

The view is that all demographic variables should clearly be considered as not appropriate for attempts at control. Even if it is known that low demographic growth, because of aging, will involve a higher relative burden of health services than high demographic growth, it would not be sensible to establish policies to increase birth rate just to decrease that burden. The argument is similar with respect to immigration policies.

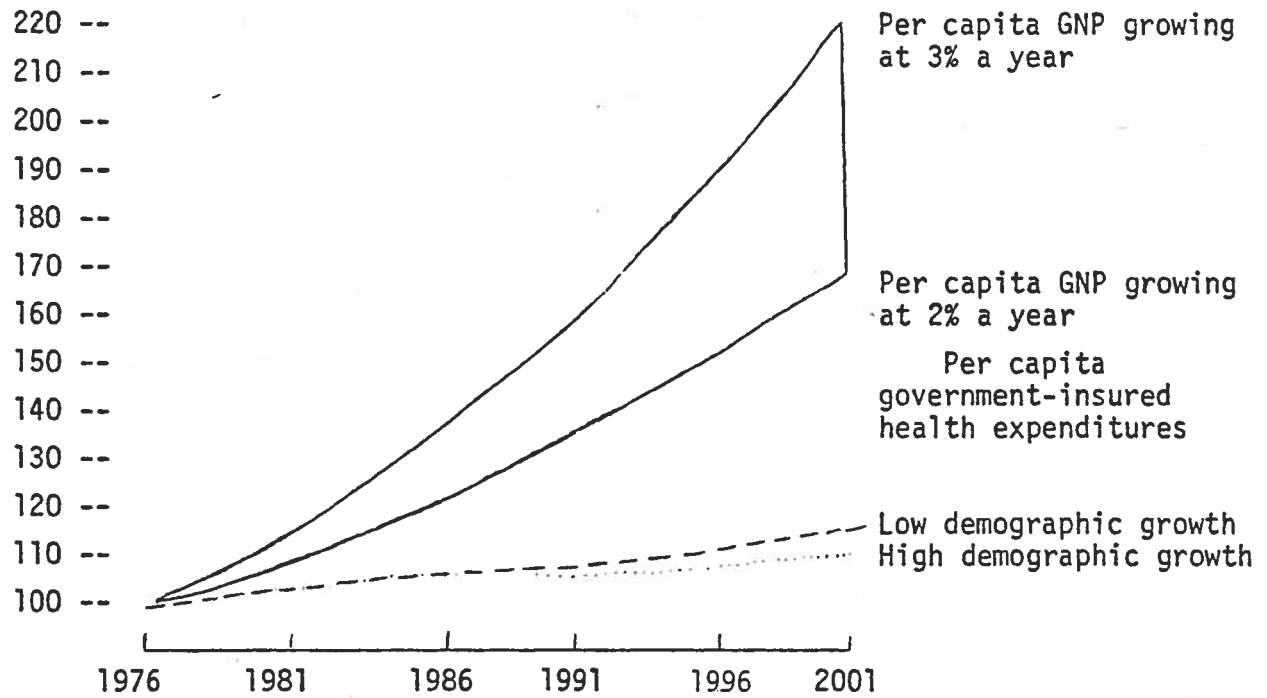
The best policies to influence the growth in government-insured health expenditures are probably those oriented towards changing consumption patterns of health services. It has been seen in one of the scenarios that a reduction in consumption could significantly change some of the trends. Thus such efforts have considerable potential.

Finally, it has been seen that changes in relative prices could have an important impact on the future share of health in the GNP. Even if relative prices in the economy are determined by market forces, in the health services sector, because of the major role of governments, it could be possible to some extent to control their growth. Keeping relative prices of health services at their present level could even decrease the share of health costs as a percentage of GNP.

In table 5.12 the evolutions of per capita GNP and government-insured health expenditures is compared for the period 1976-2001 under the assumptions that GNP per capita will grow at 2 percent and 3 percent per annum and that the relative price of government-insured health services will remain constant.

It can be clearly seen that the growth of health expenditures related to aging of the population will be much lower than the growth of GNP per capita. This means that, if consumption patterns and prices remain constant, the burden of the government-insured health services sector will decrease substantially and that governments could enjoy a margin of flexibility in the process of allocating resources between health and other sectors.

TABLE 5.12  
EVOLUTION OF PER CAPITA GNP AND GOVERNMENT-INSURED  
HEALTH EXPENDITURES AT CONSTANT RELATIVE PRICES



Source: Statistics Canada and estimates.

5.2.5. Projection of Demand, based on Health Care Expenditure

As previously mentioned in section 5.2, it is assumed that the expenditure on laboratory reagents for the next five years will increase in the same proportion as the health care expenditure.

Based on Tables 5.9 and 5.10, "Projection of Government-insured Health Expenditures" (low and high demographic growth, respectively), Table 5.13, "Annual Average Rate of Growth" (in percentages), and Table 5.14, "Projection of Demand" for the different disciplines show annual growth and total demand.

The total laboratory reagent market in Canada is estimated at \$ 66.5 million. Table 5.13 shows that, in the case of low growth of health care expenditures by the governments, the average rate of growth will be of the order of 1.7 % per annum. Therefore, total expenditure for laboratory reagents by 1985, in the case of low growth, will be of the order of \$ 7.3 million.

In the case of high growth of health care expenditures, it is estimated that the annual average rate of growth will be of the order of 2.07 %, corresponding to a total expenditure on laboratory reagents of the order of \$ 74 million.

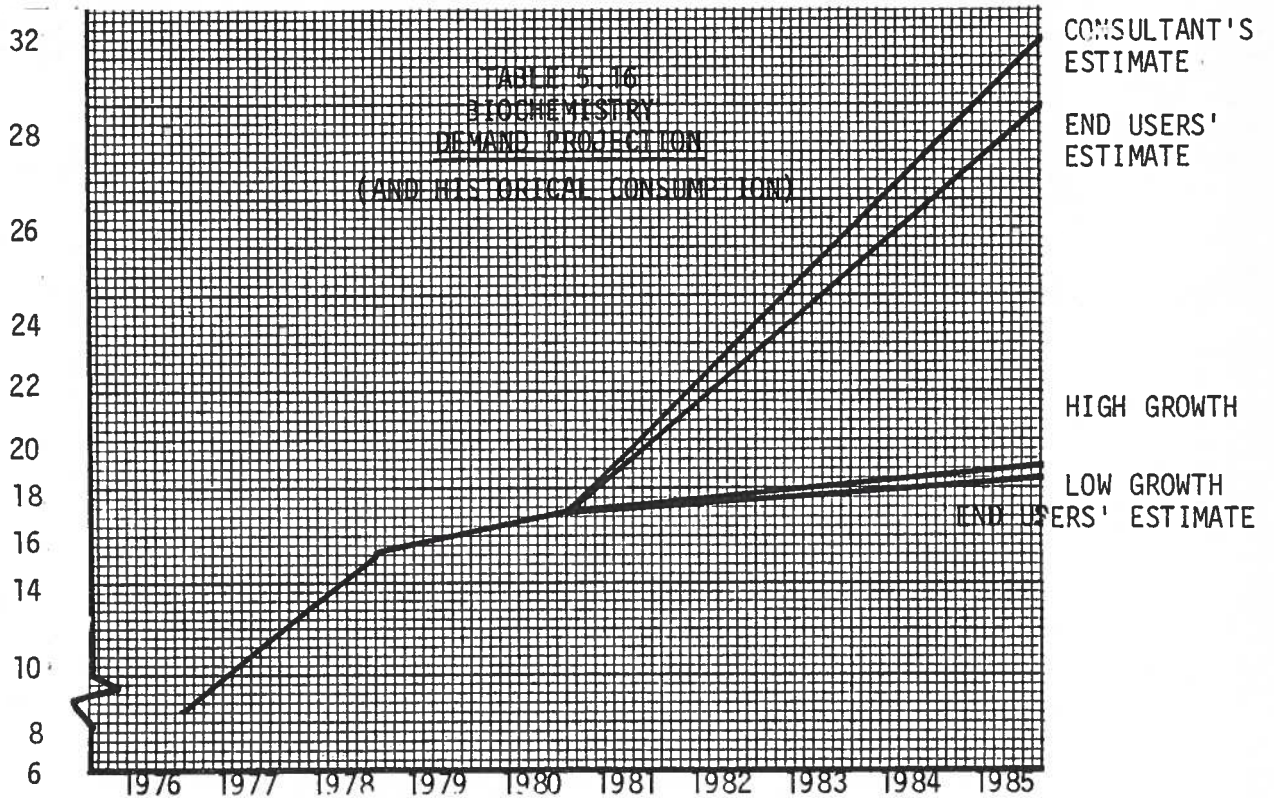
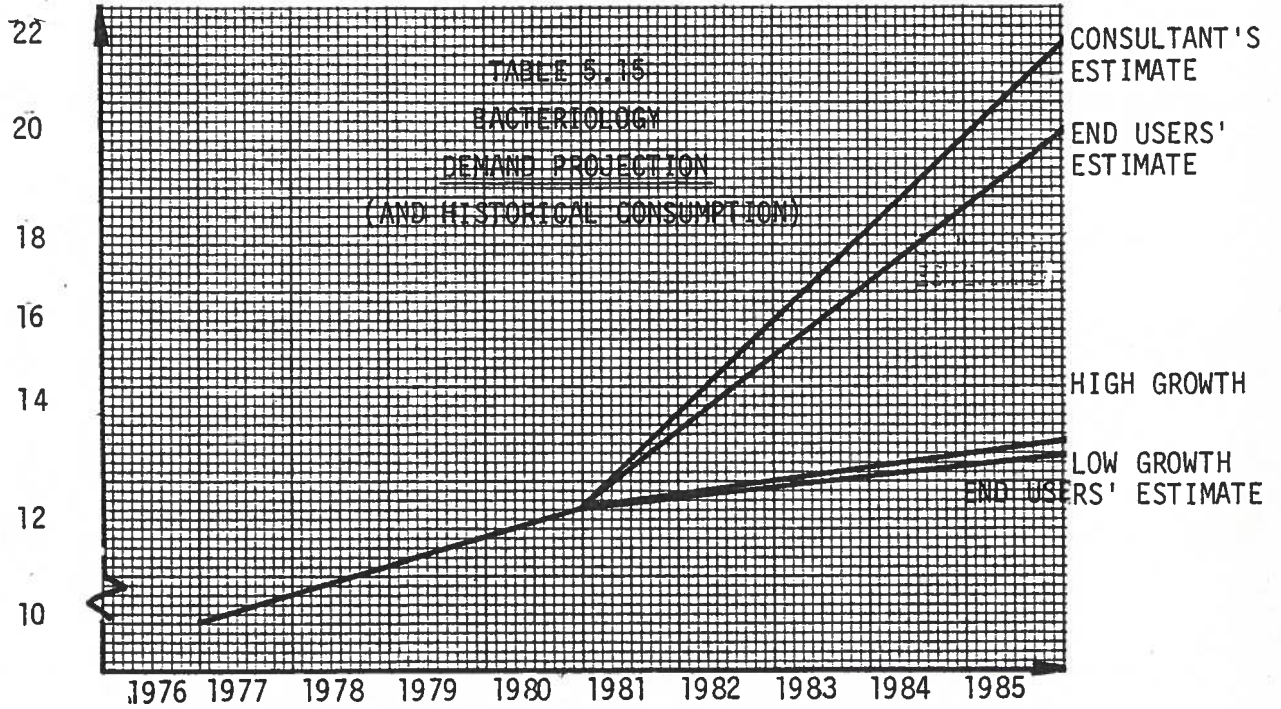
TABLE 5.13  
ANNUAL AVERAGE RATE OF GROWTH  
IN %

PRODUCT GROUP	HEALTH CARE LOW GROWTH	EXPENDITURE HIGH GROWTH	END USERS' ESTIMATE	CONSULTANT'S ESTIMATE
1. Bacteriology	1.70	2.07	10.9	13.0
2. Biochemistry	1.70	2.07	10.2	13.0
3. Blood Bank	1.70	2.07	9.4	10.0
4. Blood Coagulation	1.70	2.07	8.4	10.0
5. Hematology	1.70	2.07	9.6	10.0
6. Immunology	1.70	2.07	9.1	12.0
7. Radio-immunoassay	1.70	2.07	8.1	8.0
8. Serology	1.70	2.07	9.0	10.0
9. Urinalysis	1.70	2.07	8.8	10.0
10. Virology	1.70	2.07	11.4	13.0

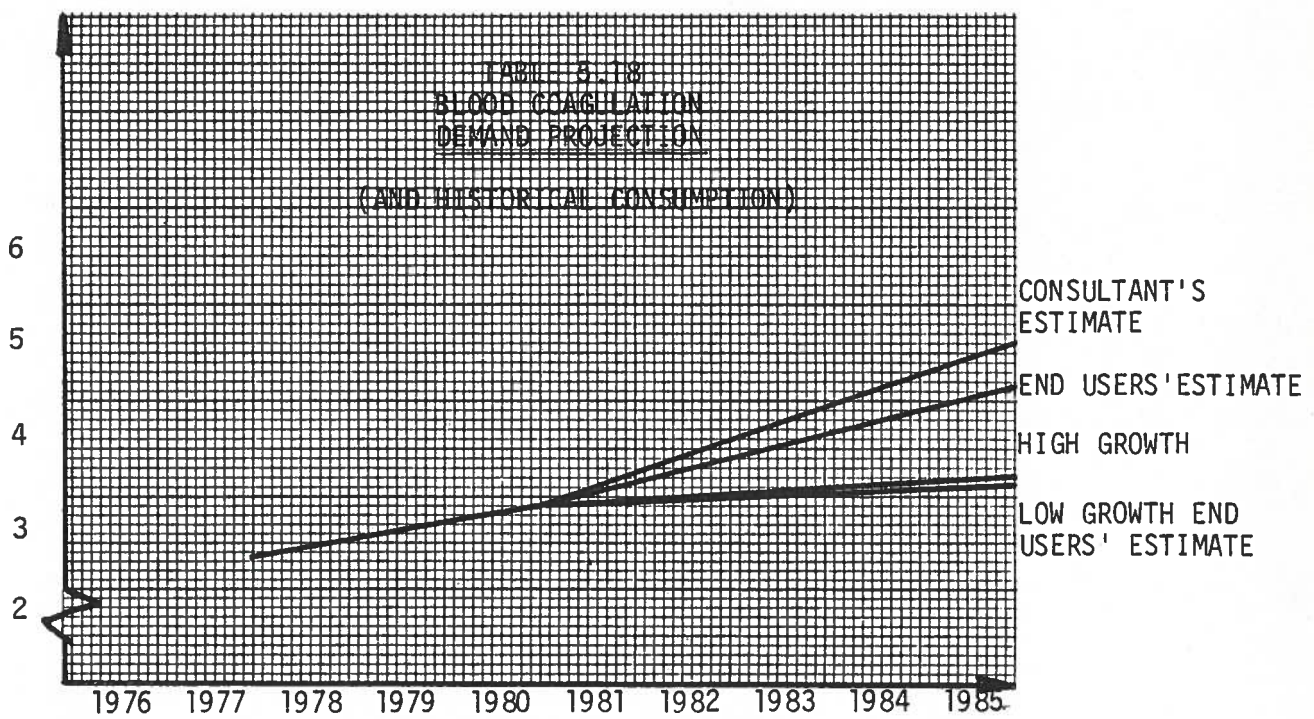
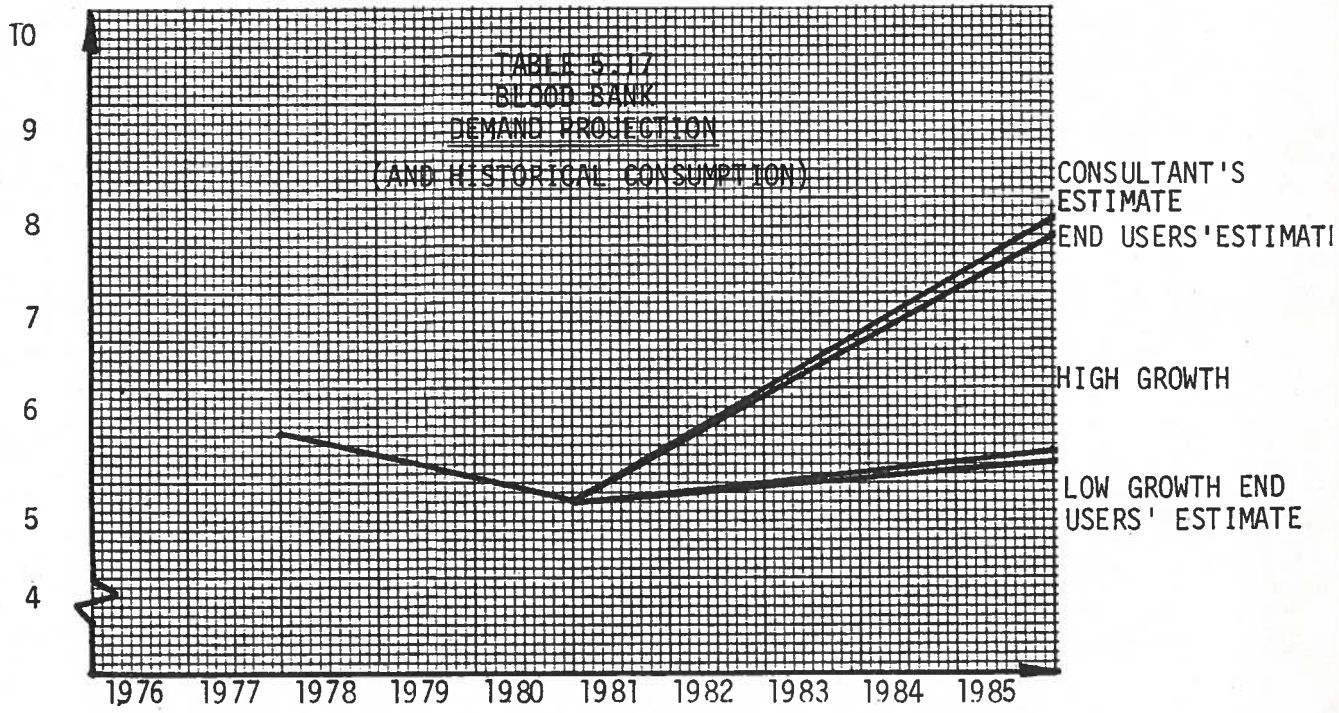
TABLE 5.14  
PROJECTION OF DEMAND

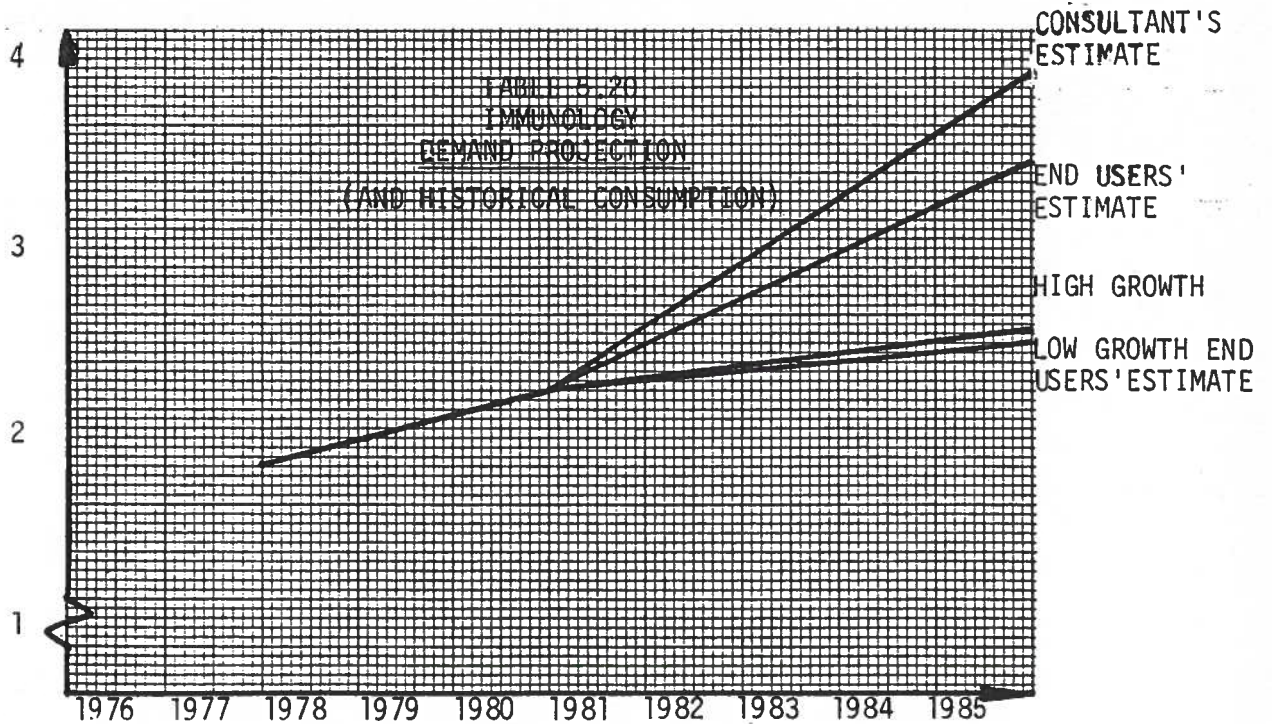
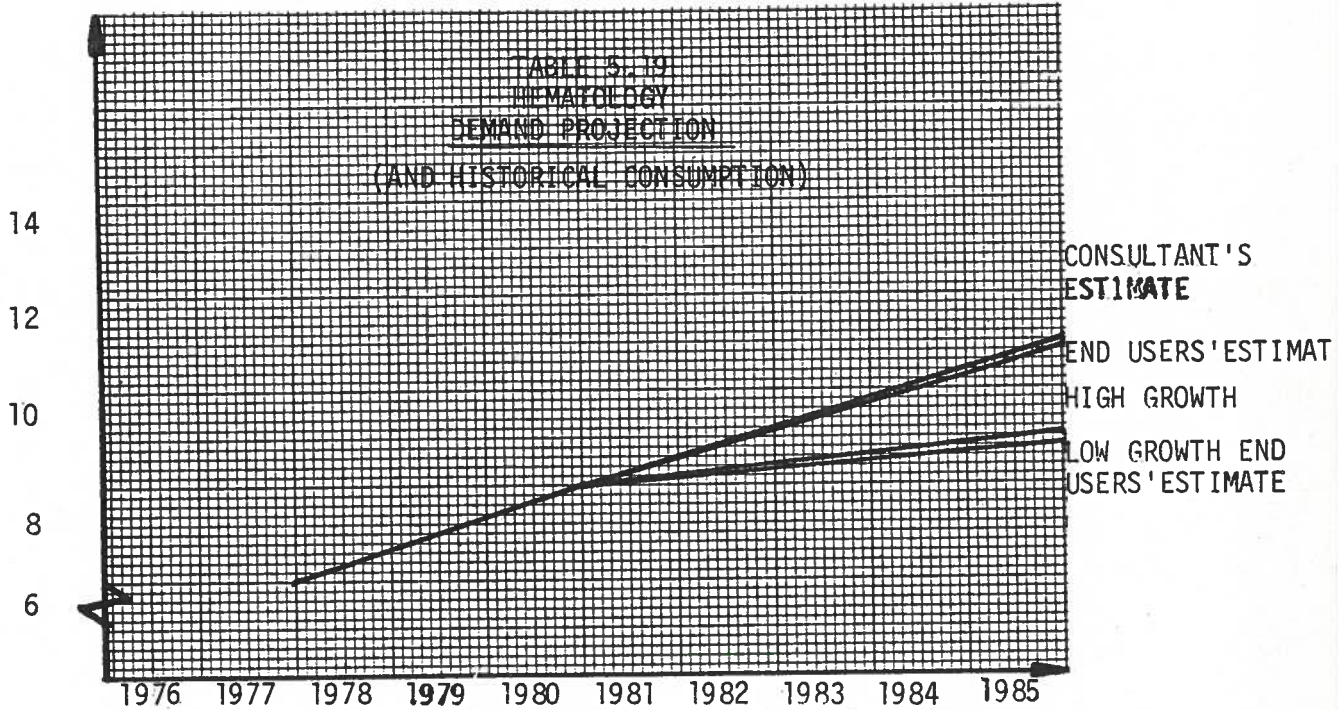
PRODUCT GROUP	ESTIMATED CON- SUMPTION 1980 (\$s IN '000s)	HEALTH CARE. LOW GROWTH 1985	EXPENDITURE HIGH GROWTH 1985	END USERS' ESTIMATE 1985	CONSULTANT'S ESTIMATE 1985	CONSULTANT'S ESTIMATE 2000
1 Bacteriology	11,531	12,569	12,799	19,343	21,245	132,873
2 Biochemistry	17,100	18,639	18,981	27,791	31,506	197,045
3 Blood Bank	4,835	5,270	5,367	7,577	7,787	32,527
4 Blood Coagulation	2,891	3,151	3,209	4,327	4,656	19,449
5 Hematology	8,092	8,820	8,982	12,979	13,032	54,439
6 Immunology	2,175	2,369	2,414	3,362	3,833	20,981
7 Radio-immunoassay	9,827	10,711	10,908	14,506	14,439	45,803
8 Serology	3,287	3,580	3,648	5,044	5,294	22,113
9 Urinalysis	3,785	4,123	4,200	5,771	6,096	25,464
10 Virology	<u>2,992</u>	<u>3,259</u>	<u>3,320</u>	<u>5,133</u>	<u>5,513</u>	<u>34,477</u>
Total Laboratory Reagents	66,515	72,491	73,828	105,833	113,401	585,171

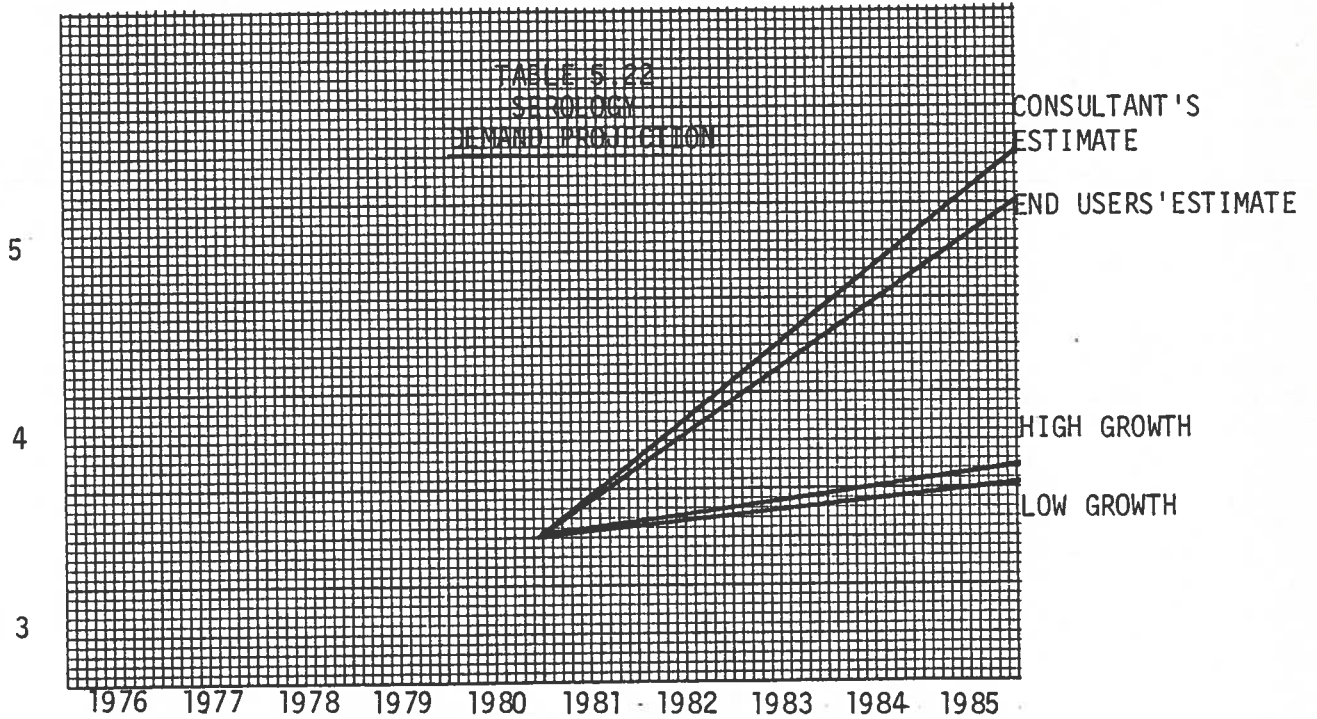
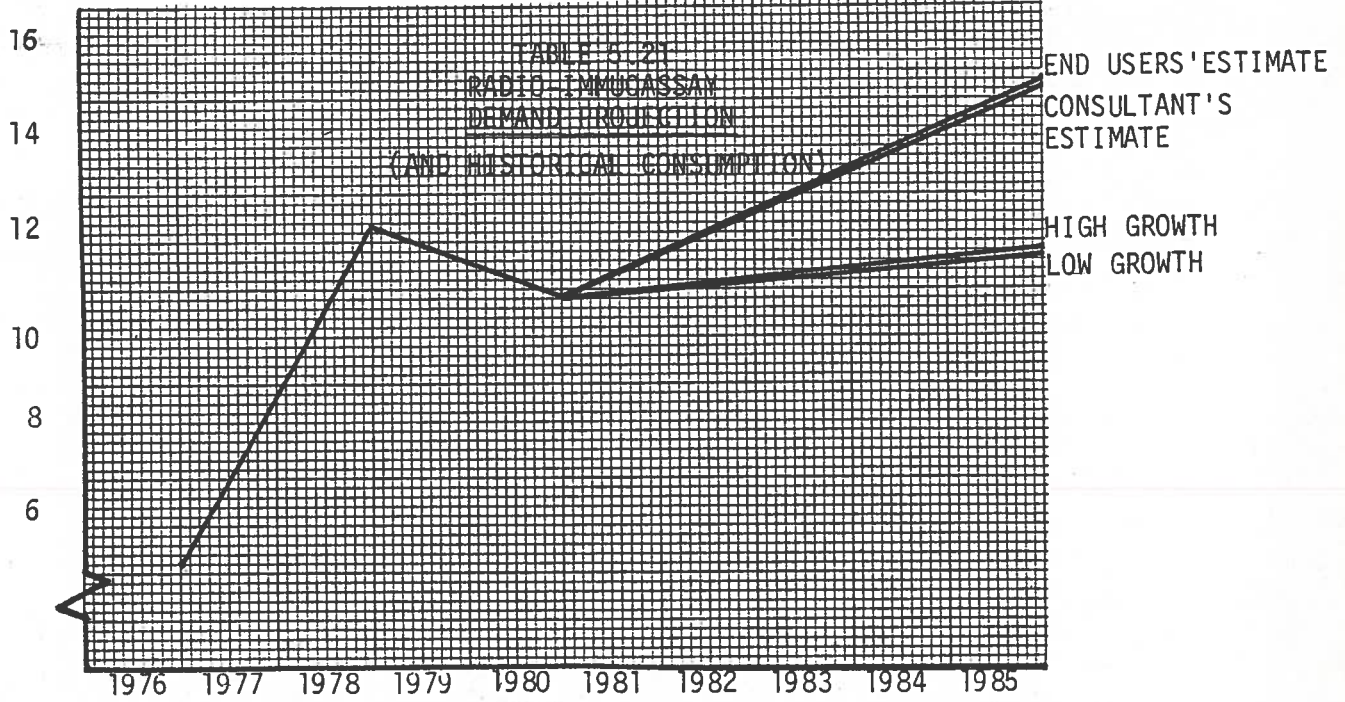
Tables 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23 and 5.24 illustrate the demand projection by discipline based on low and high growth health care expenditures.

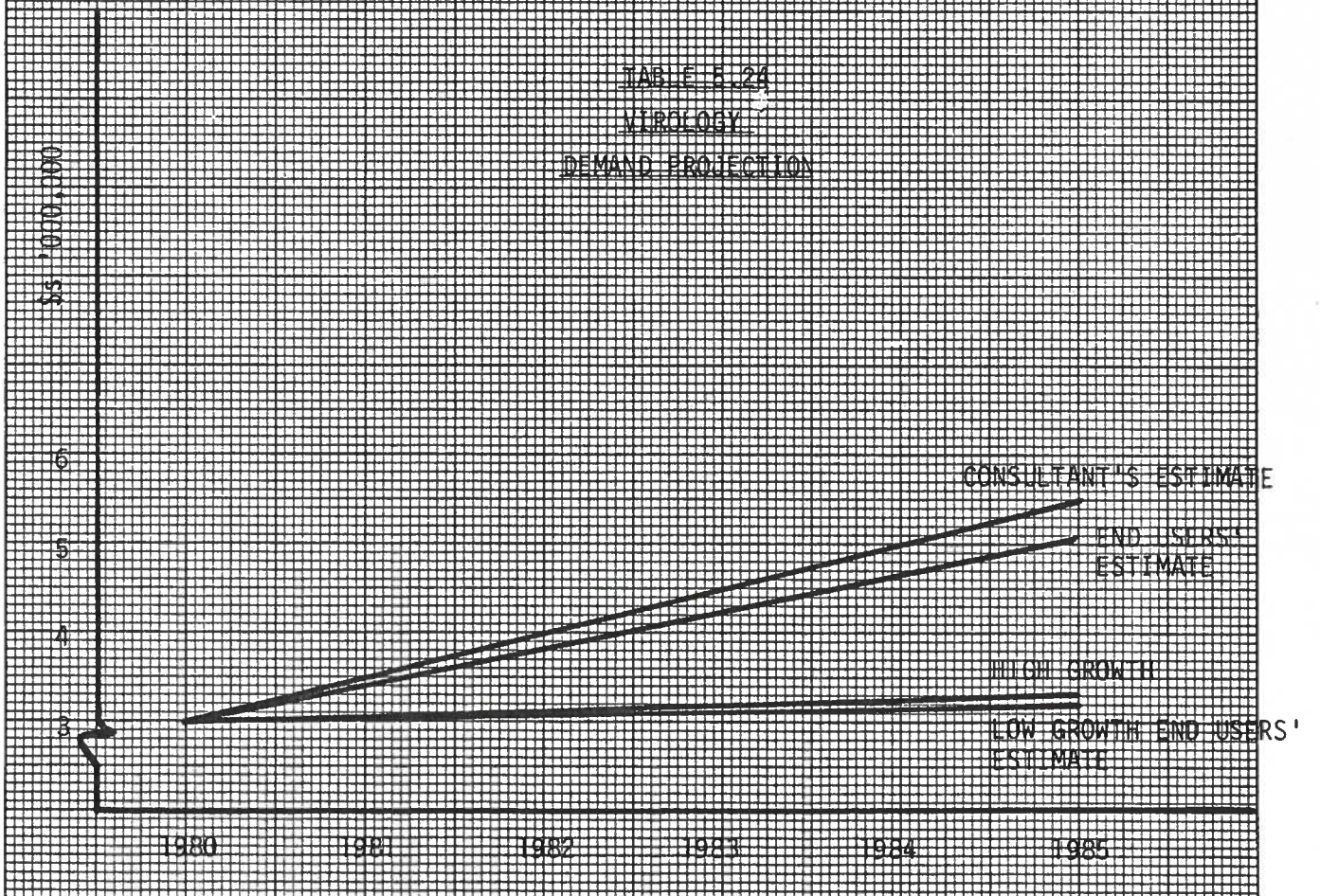
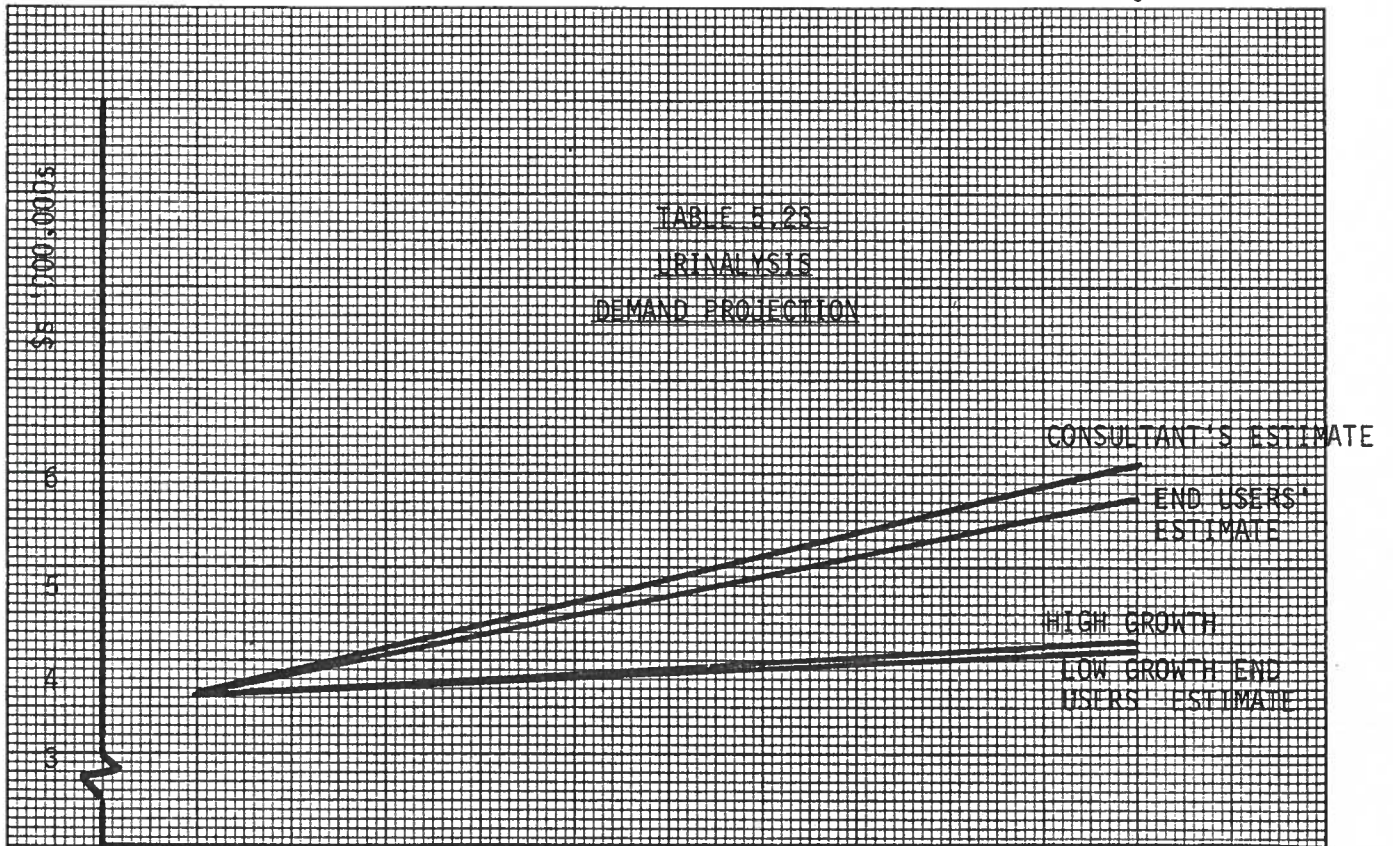












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5.2.6. Projection of Demand Based on End Users' Estimates

The respondents in hospitals, private and provincial laboratories were asked for each discipline:

"What annual increase do you foresee for a period of five years in your reagent budget? \_\_\_\_\_ % per year.

Column 4 of Table 5.13 shows the estimated average annual rate of growth of the different disciplines according to end users. In the view of end users, virology, bacteriology and biochemistry are the fastest growing segments of the laboratory reagent market.

The lowest growth is expected in radio-immunoassay, blood coagulation and urinalysis. It should, however, be pointed out that the range of growth for laboratory reagents for 1980 to 1985 will be of the order of 8.5 % to 11.5 % per annum.

The estimated total laboratory reagent expenditure in 1980 is of the order of \$ 66.5 million. (See Table 5.14, column 2.) Based on end users' estimates, the total expenditure by 1985 will be of the order of \$ 106 million. (See Table 5.14, column 5.)

Tables 5.15 to 5.24 illustrate the average increase of health care expenditures between 1980 and 1985 as estimated by end users.

5.2.7. Projection of Demand Based on the Consultant's Estimates

Based on the Consultant's mandate, the market study includes projections of indicated future demand for the various product lines.

A common method of projection is to correlate changes in demand for laboratory reagents in the area, and other areas, with certain independent variables which are known to exercise strong influence on the demand for the products. For example, the most common independent variables are population growth, demographic changes and government spending on health care. Section 5.2 correlated a number of independent variables with the growth rate of hospital disposables.

The Consultant compared the results of the statistical projection method with:

- mail questionnaires completed by the end users
- telephone interviews conducted among end users
- personal interviews conducted with key end users
- personal and telephone interviews conducted with key manufacturers, and
- personal interviews conducted with leading practitioners.

Based on the above results, the Consultant's project team discussed the weight of each of the above parameters and elaborated the projection of future demand for the next five years.

According to the Consultant's estimates, the Canadian laboratory reagent market will increase by product group as shown in Table 5.13, column 5. Based on the Consultant's estimate, the dollar value of the Canadian laboratory reagent market by 1985 will be of the order of \$ 113 million.

According to the Consultant's estimate, 5 to 10 % of the market value is imported. In this case, taking into account an average 7.5 % import estimate, the value of imports of laboratory reagents by 1985 will be of the order of \$ 105 million.

In order to obtain a long range estimate of the total Canadian diagnostic market, the Consultant assumed the same market growth of all the product groups between 1970 and 2000 as was estimated between 1980 and 1985.

Based on the same average annual rate of growth of the market between 1980 and 2000 as between 1980 and 1985, the total annual expenditure of laboratory reagents will be of the order of \$ 585 million by year 2000.

If the local manufacturing content of the above expenditure is maintained between 5 and 10 % (an average of 7.5 %), Canadian will import laboratory reagents by year 2000 of the order of \$ 540 million, which is a heavy burden on the Canadian balance of payments.

