第46次 國際統計協力機構(ISI)研究會議 參席結果 報告

(46TH SESSION, INTERNATIONAL STATISTICAL INSTITUTE)

September 8－16, 1987, TOKYO

1987

經濟企劃院 調査統計局
National Bureau of Statistics
Economic Planning Board

目　　次

Ⅰ. 第46次 國際統計協力機構(ISI)研究會議 概要

Ⅰ. 第 46 次 國際統計協力機構(ISI)研究會議概要

1. 會議開催

1) 主　催 : 日本國　政府(總務廳)

International Statistical Institute

2) 日　字 : 1987. 9. 8 - 9.16 (9日間)

3) 場　所 : 日本　東京

4) 參　加 : 全世界　各國　代表

國際機構　및　各國　研究所

大學教授　및　統計學者, 統計專門家(約 1,000名)

5) 會議開催經緯(隔年制로　開催)

○	第 45 次　會議	1985.	스페인　마드리드
○	第 46 次　會議	1987. 9.8 - 9.16	日本 東京(3回　主催)
○	第 47 次　會議	1989.	프랑스　파리(豫定)
○	第 48 次　會議	1991.	네델란드　암스텔담(豫定)
○	第 49 次　會議	1993.	中共　北京(豫定)

2. 會議目的

1) 參加國　統計機關　責任者　및　統計專門家, 學者들　간에　相互　統計技術　協力　增進

2) 統計技術　論文發表　및　討議

3) 開發途上國　統計開發　支援

3. 韓國代表團 參席者 名單

團長	孫明鉉	經濟企劃院 調査統計局長
團員	南久熙	農林水産部 統計官
〃	朴周煥	經濟企劃院 調査統計局 調査管理課長
〃	韓弼峰	經濟企劃院 調査統計局 電算分析官
〃	宣柱大	經濟企劃院 調査統計局 行政事務官
〃	全商勳	韓國銀行 調査第2部 次長
〃	李成旭	韓國産業銀行 調査部 次長

4. 學術論文發表 및 討議

1) 招請論文(Invited Papers) 31編 發表 및 討議(別添資料參照)

- 박성현 教授(서울大) 發表論文:

  The Use of Computers for Statistical Activities in Developing Countries

2) 寄託論文(Contributed Papers) 350編中 約 50編 發表 및 討議

- 김병천 教授(科學技術院) 發表論文:

  A New Approach for The W-MATRIX

3) 總會 및 分科委 開催

- 次期開催國 決定
- 理事會 會員改選
- 財務報告 等
- 一般會員(Ordinary Members) 追選

  변형윤(서울大 教授) 追選

5. 參加國 및 機關

거의 全世界各國(東亞細亞, 中東, 西歐, 東歐圈 共產國, 北歐, 北美, 南美, 아프리카)의 中央統計局 및 統計硏究機關, UN 傘下 各機關

6. 會議日程

- 9. 8 登錄 및 開會式, 日本 政府開催 晩餐會
- 9. 9 招請論文 및 寄託論文發表 討議, 各 分科委 開催
- 9.10 總會 및 分科委 開催, 招請論文 및 寄託論文發表 討議
- 9.11 招請論文 및 寄託論文發表 討議, 各 分科委 開催
- 9.12 招請論文 및 寄託論文發表 討議
- 9.13 社交行事(觀光旅行)
- 9.14 招請論文 및 寄託論文發表 討議, 分科委 開催
- 9.15 招請論文 및 寄託論文發表 討議, 分科委 開催
  總會, 分科委 開催, 送別晩餐會
- 9.16 招請 및 寄託論文發表 討議, 分科會議 理事會 開催

II. 参　考　資　料

1．主催側人士 開會演説文

- 式　　順
- 會議組織委員會（日本）委員長　演説
- 日本國　皇太子　演説
- 日本國　中曾根　首相　演説
- 東京　都知事　演説
- SIS會議議長　演説

8 September 1987, 3:30 p.m.
Opening Ceremony

Suntory Hall

PROGRAMME

Opening Remarks	*Chairman, National Organizing Committee* *Minister of State, Director-General of Management and Coordination Agency*	Tokuo Yamashita
Imperial Address		H. I. H. the Crown Prince
Speeches of Welcome	*Chairman, Honorary Committee* *Prime Minister*	Yasuhiro Nakasone
	Governor of Tokyo	Shunichi Suzuki
Presidential Message	*President, International Statistical Institute*	Sigeiti Moriguti
Celebration Performance (Pipe organ)	*Variation from the theme of Japanese old folk song "Sakura"* *J. S. Bach* *Toccata and fugue in D minor, Bwv 565*	Tsuguo Hirono

OPENING CEREMONY
8 September 1987, Tokyo

OPENING ADDRESS OF THE CHAIRMAN OF THE NATIONAL ORGANIZING COMMITTEE, MR.T.YAMASHITA, MINISTER OF STATE, DIRECTOR-GENERAL OF MANAGEMENT AND COORDINATION AGENCY

We now open the 46th Session of the International Statistical Institute.

We are honoured to have His Imperial Highness the Crown Prince in attendance, to whom we had the honour of requesting to patronize this Session, the Crown Princess, and guests representing every field today. It is a great joy for us to receive statistical experts from all over the world, and we are able to open this Session with ceremony. We would like to express our greatest appreciation to all interested sectors of society for their support and assistance on this auspicious occasion.

I trust that the 46th Session of the International Statistical Institute will promote the development of international statistics through discussions and exchanges among participants, and will expand the mutual understanding of each country participating.

46th SESSION OF THE
INTERNATIONAL
STATISTICAL INSTITUTE

46ème SESSION DE
L'INSTITUT INTERNATIONAL
DE STATISTIQUE

OPENING CEREMONY
8 September 1987, Tokyo

ADDRESS BY HIS IMPERIAL HIGHNESS THE CROWN PRINCE

It is a great pleasure for me and for all those concerned with statistics in Japan to welcome so many distinguished experts from all over the world to the 46th Session of the International Statistical Institute now being held in Tokyo.

The first Session of the International Statistical Institute convened in 1887, just one century ago. The International Statistical Institute has always been highly considered as an international academic organization and since its institution has contributed to the promotion of international cooperation, and to development and progress in the field of statistics.

Twenty-seven years ago I attended the 32nd Session which was held in Tokyo. Today I am very pleased to be able to welcome another Session here in Tokyo. During the years between the 32nd Session and 46th Session, we have observed the deepening of international exchange and the strengthening of interdependence. I feel that statistics has played a great role in such development of internationalization. Moreover, it is important that statistics be further developed and utilized as a vital index domestically and internationally in order that the peoples of the world may improve their standard of living and live a peaceful life.

I believe that this 46th Session, where various issues concerning today's statistics will be discussed by experts from around the world, will contribute not only to the progress of statistics but also to the deepening of mutual understanding among nations.

In closing, I would like to express my sincere hope that this Session will be most fruitful.

46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

OPENING CEREMONY
8 September 1987, Tokyo

WELCOMING ADDRESS OF THE CHAIRMAN OF THE HONORARY COMMITTEE, THE PRIME MINISTER, MR. Y. NAKASONE

It is my great pleasure to be here at the opening of the 46th Session of the International Statistical Institute. Gathered here today are many statistical experts from all over the world. I would like to warmly welcome all of you who are visiting Japan, and I would also like to express my great appreciation to officers of the International Statistical Institute and all those who have worked hard to organize this Tokyo Session.

I would like to express my deepest respect to the International Statistical Institute, which was established with the goal of international cooperation with regard to statistics and to expedite the progress and development of statistics. The Institute has achieved many important results and has contributed greatly toward the development of various cultures in the world for a century since its establishment.

Japan has attended almost all the sessions since the 7th which was held in Oslo in 1899. Participation in the 7th Session was a great turning point in the progress of Japan's statistical technology and theory, and has greatly contributed to improving the living standards in our country.

Sessions of the International Statistical Institute have been held by the governments of different countries almost every other year. This session, which carries on a noble historical tradition, is the third time it has been held in Japan, following the 19th session which was held in 1930 and the 32nd session in 1960. I believe this is a great honour for Japan. I believe that our country's statistics will be improved even further and that our citizens will have an increased interest through the outcome of this international session.

Through the progress of science, technology and other areas in recent years, mankind is enjoying a greater prosperity than ever before. However, in order to maintain this prosperity, we must realize that there are important subjects which require our mutual understanding and the pooling of human intelligence.

Every country is striving to find answers through mutual cooperation. However, it is very important to adequately consider the aspect of international cooperation in the selection and propulsion of the policy. Because of this, the importance of accurately grasping and analyzing situations related to politics, economy and society both within and outside each individual country, as well as

comparing on an international basis various data based on the same standards, is increasing more than ever before.

Under such situations, every country eagerly awaits further developments in statistical theories and technology. I expect all those in attendance will actively discuss the new leap in statistical information and the further promotion of international cooperation. I trust this session will greatly contribute to enlarging the understanding and trust between all countries and nations.

I pray at the close of my welcoming address that your stay in Japan will be fruitful, enjoyable and comfortable.

OPENING CEREMONY
8 September 1987, Tokyo

WELCOMING ADDRESS BY MR. S. SUZUKI, THE GOVERNOR OF TOKYO

I am very privileged as the Governor of Tokyo to be able to give a welcoming address, and for receiving the attendance of Their Imperial Highnesses the Crown Prince and Princess, for those who have come to attend this Session from all over the world at this, the opening of the 46th Session of the International Statistical Institute.

I would like to congratulate the Institute for this, its centennial year, as I understand that this year is the 100th since the first Session was held in Rome in 1887. It has been 27 years since the 32nd Session was held in Japan in 1960. During these years Japan, as well as the rest of the world, has undergone great change.

You can see that Tokyo is diligently undergoing dynamic change to prepare itself as a city for the 21st century.

It is extremely important for administration, industries and others to analyze the past, grasp present situations and to estimate the future accurately, in order to solve many challenges and in order to prosper in the future. Naturally, you are already aware that accurate judgements cannot be achieved without correct statistics and other information. Statistics indicate previous human knowledge and business trends, and are an important key in the cultivation of the future of human kind. Because of this reason, I would like to express my great respect and gratitude to the International Statistical Institute, in which governments and private organizations are united and have greatly contributed to the development of statistics and international cooperation, for its efforts and brilliant achievements in its one hundred year history.

We have entered an era of an information-seeking society, and the population of the world now exceeds five billion. It is a noble ambition for us to work for the coexistance and prosperity of mankind based on mutual understanding and cooperation of every country in the world. Under these kinds of circumstances, the role of statistics is becoming increasingly important, and the expectations of mutual cooperation of statistics-related personnel are also growing. I hope from my heart for the further activity and development of our International Statistical Institute to which more than one hundred countries and statistical personnel in international agencies belong.

I pray that this Session bring fruitful results, and also for your good health as well as your work. I hope also that your stay in Tokyo will be an enjoyable and meaningful experience.

46th SESSION OF THE
INTERNATIONAL
STATISTICAL INSTITUTE

46ème SESSION DE
L'INSTITUT INTERNATIONAL
DE STATISTIQUE

OPENING CEREMONY
8 September 1987, Tokyo

PRESIDENTIAL ADDRESS, DR. S. MORIGUTI

Your Imperial Highnesses, Distinguished Guests, Ladies and Gentlemen.

On behalf of the members of the International Statistical Institute and all the other participants, I have the honour and privilege of thanking Your Imperial Highness the Crown Prince for your gracious patronage to this Session and your presence here together with Her Imperial Highness the Crown Princess. Some of us here pleasantly remember the previous Tokyo Session in 1960, to which you extended your patronage also, soon after your marriage.

I would like to thank the Japanese Government for inviting the Institute to meet here in Tokyo. Thanks are also due to a hierarchy of committees and those who worked very hard in those committees, as well as the people who warmly supported them in many ways.

This is the third Session to be held in Japan, and the sixth in Asia. By the time we held the Centenary Session in Amsterdam two years ago, many kinds of reform and re-orientation had been proposed and carried out. Now we have a new set of Statutes and Bylaws, and a new Section "the International Association for Official Statistics". We have a research arm: the ISI Research Centre, established on the resources left after the successful termination of the ambitious work of the World Fertility Survey(WFS).

It is interesting to note, incidentally, that the World Development Report 1984 of the World Bank refers to the WFS data extensively, and describes this part of the world, East Asia, as the region most successful in population policy. There are many NICs (newly industrialized countries/areas) where fertility declined as the industrialization progressed. Japan has a peculiar tradition (based on a superstition) of mass birth-control exercise every 60 years. The last such year was 1966, and the birth rate dropped to 2/3 of the average. Now it is almost equal to that level. China, with a quarter of the total world population, has been promoting the one-child policy. Other countries in this region also have a relatively good record of fertility reduction, thus breaking a vicious circle of poverty and high fertility to a great extent.

So it is significant that the first Session in the second century of the ISI is held in this region. It is a suitable occasion for us to think of what to do for the future of human beings, while only less than 14 years are left before we enter the 21st Century.

All countries of the world, both developed and developing, are suffering from economic and social problems. No one country can tackle the problems by herself. Wise and timely, coordinated efforts are required. Those efforts can be planned and carried out only if good statistical data are available. It is said that statistics started as an activity to measure the status of a state. Now what is required for steering the space-craft Earth correctly is to measure the status of the whole world – every part of it – accurately enough. Here is the greatest challenge for all statisticians. I hope the ISI is now ready to face this challenge squarely.

The problem is complex:– complex in the sense that it has a real part and an imaginary part just like a complex number. Along the real axis, the direction of the solution seems to be simple and clear, at least in principle. Huge unemployment figure and unused productive capacity mean a great surplus in production potential. This surplus should be mobilized to enhance the productivity of the workers, especially those in developing countries. For that, many kinds of infrastructure projects, hard and soft, should be planned and carried out.

Statistics is of course one of the most fundamental soft infrastructures. As another important soft infrastructure, I would like to mention here Statistical Quality Control. Industry of this country learned it right after the War from the U.S.A., especially through the dedicated efforts of Dr. Deming. They did faithfully what he taught them to do. Proliferation of robots, for instance, is made possible only when over-all quality of the materials is assured, not on the "percentage-defective" level, but on the "permillage" level, sometimes even on the "p.p.m." level. And there must be a nice and competent human care-taker by the robot's side. That kind of intelligent worker is brought up through a long experience of Quality Control activities. The ideas and methodologies of Statistical Quality Control are spreading also into the service industries. Good quality of the service is indispensable for the good quality of life. I hope this Session, together with the ICQC (International Conference on Quality Control) '87 to be held here in coming October, will contribute to increasing the public awareness of this particular infrastructure as an essential basis of industrial development.

Now let us turn to the other axis. Along the imaginary axis, where money plays a key role, the solution is not so simple and clear. All kinds of statistics show that where resources for real investments are needed the most, there is always a shortage of money, and new borrowings are nearly impossible because of the already accumulated debts. On the other hand, in such a country as Japan, where much money has been accumulated, and not enough opportunities are found for profitable real investments, we see a rather pathological boom of zai-teku – being a parody of hai-teku (for "high technologies"), it could be translated into fi-tech (for "financial techniques"). It implies the rush of money towards aquisition of pieces of land in the Tokyo area, for instance, and towards stock market, thus causing a skyrocketing rise of land price and stock price index. Since there are extreme points in the opposite directions along the imaginary axis, there must be a possible

way of reconciling them, so that the imaginary part will properly function, as it should, to assure the most efficient and harmonious world development along the real axis. (In saying this, what I have in mind is the fact that a mathematical function displays its full beauty when viewed as a complex function on the complex number plane.)

Solution can be derived only if the situation is recognized clearly, and for that we statisticians have a great responsibility.

It seems to me that there is a factor which makes the complex situation even more complex:–Economics teachers have been teaching the "Law of Diminishing Returns". Now I think the contemporary economists and sociologists may start teaching the "Law of Diminishing Boundaries". Boundaries of nation states are rapidly losing their protectionistic power, as the multinational corporations exercise the strategies on the global scale. (I do not imply to deplore the trend.) Boundaries between industrial categories are also diminishing rapidly, as each company increases its versatility in products and as the inter-categorical merger or coalition proceeds. A person may have several occupations at the same time. And so on, and so forth.

If the objects of our statistical surveys are thus changing, we have to adjust ourselves to the situation. Classification must catch up. Even the principle of classification may have to be reconsidered, because the present tree-structured classification scheme may not be suitable any more to deal with the situation of "diminishing boundaries".

Bureaucratic sectionalism should be well reconciled through over-all coordination, as almost every new problem cuts across the ministerial boundaries. Service industry statistics, environment statistics, and many others.

In this connection, we can be proud of the fact that the ISI had pursued the way toward the "integration of statistics" for several years, and with certain degree of success. The centripetal force provided by this endeavour will be a great help in coping with the challenge.

In concluding, I would like to state my sincere desire that this 46th Session of the International Statistical Institute will produce a strong impetus and useful suggestions towards the solution of the complex problems of the world.

Thank you.

2. 會議任員構成 內容

- ○ 名譽委員會
- ○ ISI理事會 및 事務局
- ○ 會議進行 協議委員會
- ○ 主催國 組織委員會
- ○ 計劃調整 委員會

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Institut International de Statistique

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* *Secrétaire Général du Secrétariat du Comité National d'Organisation pour la 46ème Session de l'IIS.*

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Comité Local des Programmes

Chairman/Président	Kei Takeuchi
Vice-Chairman/Vice-Président	M. Ide

3. 會議參席者　名單

LIST OF PARTICIPANTS

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By

The

International Statistical Institute

46th SESSION OF THE

INTERNATIONAL

STATISTICAL INSTITUTE

8 - 16 September 1987

Tokyo, Japan

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‡ Galterio, Laura

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* Park, Joo-Hwan

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* Spar, Elizabeth A.

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* Vitali, Francesco
* Aemon, Gabriella
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4. 會議進行概要

Outline of the Session Schedule
Emploi du Temps de la Session

Sept. 1987	9:00~12:00	12:00~14:30
7(Mon.)		
8(Tues.)	Registration (9:00~18:00)	
9(Wed.)	*Invited Papers Meetings* 1 The trend of official statistics. Some problems connected with the future. A 25 Self-similar processes. F 26 Principles and strategies of data analysis. B *Contributed Papers Meetings* 112 Stochastic models in biomedicine. H1 114 Survey-sampling. G 134 Multivariate analysis (I). I 140 Distribution (I). H2 Poster Meeting 1 Statistical inference. C	ISI Programme Committee Bernoulli Society Council I IAOS Executive Committee I IASC Council I IASS Programme Committee
10(Thur.)	ISI General Assembly A+B	ISI Publications Committee I ISI Research Centre Steering Committee I Bernoulli Society Programme Committee I IAOS Programme Committee IASC Programme Committee IASS Council I
11(Fri.)	*Invited Papers Meeting* 6 Papers by special invitation of the President. A+B	ISI Programme Co-ordinating Committee I ISI Nominations Committee I ISI Statistical Education Committee I Bernoulli Society General Assembly IAOS General Assembly I

14:30~17:30	Evening
Registration (13:00~18:00)	
Opening Ceremony Suntory Hall (15:30~16:30)	Welcoming Reception A+B+C (17:30~19:30)
Invited Papers Meetings 2 Development of statistics in Japan. Past experiences and present problems. A 23 New developments in time series modelling and analysis. F 27 Survey processing on microcomputers. B *Contributed Papers Meetings* 113 Early stopping in medical studies. H2 115 Problems in designing case-control studies. G 119 Medical statistics (I). I 122 Demography. H1 135 Multivariate analysis (II). I 141 Distribution (II). H2 Poster Meeting 2 Socio-economic studies. C	
Invited Papers Meetings 5 Statistical techniques for improvement of quality and productivity. A 20 Advances in data banks and network. Building and management. B 24 Estimation from accelerated tests and short term tests in reliability and medicine. F *Contributed Papers Meetings* 110 Timeliness and accuracy in preliminary estimates and revisions of economic data. I 117 Asymptotic expansions and approximations of statistics (I). H2 124 Price indices. G 129 Official statistics and surveys (I). G Open Meeting 1 (ISI Research Programme) H1 Open Meeting 2 (World Bank) H1	
Invited Papers Meetings 9 Master samples in national household surveys. A 17 Problems of and approaches to analysing large data sets. B 22 Recursive procedures for time sequenced data. F	

Sept. 1987	9:00~12:00	12:00~14:30
11(Fri.)		
12(Sat.)	*Invited Papers Meetings* 3 Analysis of historical records. Comparative historical demography. A 8 Measuring change from surveys. F 16 Statistical needs of developing countries. B *Contributed Papers Meetings* 101 Current issues in principles of statistical inference. G 103 Statistical methodology for studying the status of women (II). H1 123 Statistical computing. I 137 Stochastic process (II). G 143 Nonparametrics. H2 144 Statistical inference (I). H1	
13(Sun.)	Excursions	
14(Mon.)	*Invited Papers Meetings* 10 Variance estimation with complex samples. F 11 The future of the population census. A 15 Artificial intelligence and expert systems in statistics. B *Contributed Papers Meetings* 102 Statistical methodology for studying the status of women (I). H1 111 Analysis of circular data. G 139 Design of experiments. H2 Poster Meeting 3 Multivariate analysis. C Open Meeting 4 (ISI Statistical Education Programme) I	ISI Programme Co-ordinating Committee II Bernoulli Society Council II IAOS Executive Committee II IASC General Assembly IASS General Assembly

14:30~17:30	Evening
Contributed Papers Meetings 106 Handling missing data in surveys. G 116 Confidentiality protection in national statistical offices. I 127 Time series (I). H1 130 Official statistics and surveys (II). G 132 Testing hypothesis (I). H2 136 Stochastic process (I). H2 Open Meeting 3 (ISI Scientific Programme) H1	
Excursions	
Invited Papers Meetings 7 Best papers by recent graduates from developing countries. F 12 Methodological issues in surveys for price indices. A 28 Statistical computing in the 90's. Impact of the fifth generation. B *Contributed Papers Meetings* 104 Census evaluation (I). G 118 Asymptotic expansions and approximations of statistics (II). I 120 Medical statistics (II). H1 128 Time series (II). H2 Poster Meeting 4 Indices and others. C	

Sept. 1987	9:00~12:00	12:00~14:30
15(Tues.)	*Invited Papers Meetings* 13 Effects of mode of data collection on survey response. A 16 Statistical graphics. B 29 Small area statistics. F *Contributed Papers Meetings* 105 Census evaluation (II). I 108 Repeated measurement and crossover design. G 121 Hazard analysis. H1 146 Miscellaneous. H2	ISI Publications Committee II ISI Nominations Committee II ISI Statistical Education Committee II ISI Research Centre Steering Committee II IASS Council II
16(Wed.)	*Invited Papers Meetings* 14 Statistical education in government and industry. A 21 Statistical methods for spatial image analysis. B 30 New developments in the statistical methodology in chemistry. F *Contributed Papers Meetings* 125 Socio-economic studies (I). H1 131 Sampling methods. H2 133 Testing hypothesis (II). G 138 Estimation. I 142 Distribution (III) G ISI Council P	IAOS General Assembly II IASC Council II

A : Ohtori-Higashi
B : Ohtori-Naka
C : Ohtori-Nishi
F : Zuiun II and III
G : Yakumo
H1: Seiun I
H2: Seiun II
I : Ryoun
J : Kujaku
K : Hibari
L : Chidori
M: Shirasagi
P : Toki

14:30~17:30	Evening
ISI General Assembly A+B	Sayonara Party (19:00~21:00) B+C
Invited Papers Meetings 4 Measurement and utilization of health related indicators. F 19 Recent developments of software systems for time series analysis. A 31 Environment risk assessment. B *Contributed Papers Meetings* 107 Stochastic differential equations. Theory and applications. H2 109 Statistical methods for data with outliers. G 126 Socio-economic studies (II). H1 145 Statistical inference (II). I ISI Council P	

5. 學術論文發表 및 討議進行計劃

Schedule of Scientific Meetings
Programme des Réunions Scientifiques

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9 Sept. (Wed.) 9:00 - 12:00 Room A (Ohtori - Higashi)

Topic / Thème 1

The trend of official statistics. Some problems connected with the future.

L'évolution des statistiques officielles. Quelques questions relatives à leur avenir.

Organizer/Organisateur: *V. Nyitrai (Hungary)*
Chairperson/Président: *V. Nyitrai (Hungary)*

1.1 *Xu Gang (China)*
The role of government census offices in organization and taking industrial census.

1.2 *J. Češka (Czechoslovakia)*
Development of Czechoslovak official statistics in the eighties.

1.3 *L. Lyberg, E. Rapaport (Sweden)*
The advance of statistical theory and methodology and their uses in official statistics.

1.4 *M.G. Sardana (India)*
Present and future trends of collecting, processing and utilisation of official statistics.

1.5 *V. Drjuchin (USSR)*
Trends in national accounting and their effect on links between SNA and MPS.

Discussants/Discussiants: *M.A. Sahib (Fiji)*
D.M. Gilford (USA)
A. Martin (Canada)

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9 Sept. (Wed.) 9:00 - 12:00 Room F (Zuiun II and III)

Topic / Thème 25

Self-similar processes.

Processus auto-similaires.

Organizer/Organisateur: *M. Maejima (Japan)*
Chairperson/Président: *M. Maejima (Japan)*

25.1 *W. Vervaat (Netherlands)*
Properties of general self-similar processes.

25.2 *H. Dehling, M.S. Taqqu (USA)*
The limit behavior of empirical processes and symmetric statistics for stationary sequences.

25.3 *F.R. Hampel (FRG)*
Data analysis and self-similar processes.

Discussants/Discussiants: *C.C. Heyde (Australia)*
H. Oodaira (Japan)
R. Dahlhaus (FRG)

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9 Sept. (Wed.) 9:00 - 12:00 Room B (Ohtori - Naka)

Topic / Thème 26

Principles and strategies of data analysis.

Principes et stratégies de l'analyse des données.

Organizer/Organisateur: *R. Gnanadesikan (India)*
Chairperson/Président: *R. Gnanadesikan (India)*

26.1 *C.L. Mallows (UK), D. Pregibon (USA)*
Some principles of data analysis.

26.2 *C.R. Rao (USA)*
Strategies of data analysis.

26.3 *W.L. Nicholson (USA)*
Some computing environments for data analysis.

Discussant/Discussiant: *C. Hayashi (Japan)*

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9 Sept. (Wed.) 9:00 - 10:20 Room G (Yakumo)

Topic / Thème 114

Survey-sampling.

Enquête-échantillonnage.

Organizer/Organisateur: *V.P. Godambe (India)*
Chairperson/Président: *A. Asai (Japan)*

114.1 *G. Cicchitelli, G.E. Montanari (Italy)* *
On a generalisation of the Horvitz-Thompson estimator. (*p. 73*)

114.2 *T. Wright (USA)*
An empirical investigation of the use of ranks in *nps* sampling. (*p. 475*)

114.3 *S.E. Fienberg (Canada), J.M. Tanur (USA)*
Inferential aspects of assessing the input of cognitive processes in survey design. (*p. 113*)

* The figures in parentheses refer to pages in the volume of contributed papers.

* Les chiffres entre parenthèses se rapportent aux pages du volume des communications libres.

114.4 *H.F. Huddleston (USA)*
Cocoa forecasting in West Africa. (*p. 177*)

By title *V.R. Sastry-Kuppa (India)*
Interchangeability of units in a 2-stage survey design. (*p. 389*)

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9 Sept. (Wed.) 9:00 - 11:20 Room I (Ryoun)

Topic / Thème 134

Multivariate analysis (I).

Analyse multivariante (I).

Chairperson/Président: *Y. Escoufier (France)*

134.1 *H. Salomaa (Finland)*
Factor analysis of dichotomous variables: the asymptotic distribution of loading estimators based on factor analysis of the matrix of tetrachoric correlations. (*p. 387*)

134.2 *M. Okamoto (Japan)*
Number-of-factors problem and early-step estimator in least-squares factor analysis. (*p. 329*)

134.3 *Y. Kano (Japan)*
New estimation procedure in factor analysis. (*p. 221*)

134.4 *S. Pynnönen (Finland)*
Likelihood ratio test for the additional information of variables in quadratic discriminant analysis. (*p. 357*)

134.5 *H. Hyakutake, M. Siotani (Japan)*
Mean and variance of sample size in heteroscedastic method. (*p. 183*)

134.6 *H. Yanai (Japan)*
A generalized expression of Moore-Penrose G-inverse matrix and its application to statistical inference. (*p. 489*)

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9 Sept. (Wed.) 9:00 - 11:20 Room H1 (Seiun I)

Topic / Thème 112

Stochastic models in biomedicine.

Modèles stochastiques en biomédecine.

Organizer/Organisateur: *E. Marubini (Italy)*
Chairperson/Président: *E. Marubini (Italy)*

112.1 *C.L. Chiang (USA)*
A stochastic model of neoplasm incidence and the time to the appearance of tumor. (*p. 67*)

112.2 *C. Rossi, L. De Paolis, M. Benassi (Italy)*
A stochastic model of chemotherapy for tumor diseases. (*p. 377*)

112.3 *G. Serio, A. Morabito (Italy)*
Considerations on a stochastic survival model for chronic diseases. (*p. 399*)

112.4 *A. Piccoli, F. Pesarin (Italy)*
Long-term monitoring of renal transplant patients by the Kalman filter. (*p. 347*)

112.5 *M. Masuyama (Japan)*
Un point presque fixe sur la courbe de la croissance de la taille. (*p. 279*)

112.6 *G.L. Yang (USA)*
Estimation in aggregated Markov chains with application to neuron data. (*p. 491*)

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9 Sept. (Wed.) 9:00 - 11:40 Room H2 (Seiun II)

Topic / Thème 140

Distribution (I).

Distribution (I).

Chairperson/Président: *G.N. Wilkinson (Australia)*

140.1 *N.L. Johnson (UK), S. Kotz (USA)*
Characterization based on conditional distributions. (*p. 211*)

140.2 *A.H. Khan (Jordan)*
Characterizations of the Pareto and the power function distributions through inverse and ratio order statistics. (*p. 231*)

140.3 *R.V. Hogg (USA)*
On the selection of the underlying distributions: alternative measures of kurtosis and skewness. (*p. 169*)

140.4 *B.V. Frosini (Italy)*
Concepts and measures of asymmetry. (*p. 129*)

140.5 *V.R.R. Uppuluri, T.N. Bhargava (USA)*
Measures of diversity based on fuzzy multinomial distributions. (*p. 461*)

140.6 *B. Harris (USA)*
Applications of a combinatorial composition theorem in the theory of random mappings, II. (*p. 161*)

140.7 *A.M. Mathai, G. Pederzoli (Canada)*
Distributional aspects of random volume contents. (*p. 281*)

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9 Sept. (Wed.) 9:00 - 12:00 Room C (Ohtori-Nishi)

Poster meeting / Réunion d'affichage 1

Statistical inference.

Inférence statistique.

1. *G. Consonni (Italy)*
A predictive approach to symmetry hypotheses testing. (*p. 79*)

2. *R. Takahashi (Japan)*
Some properties of extreme value distributions. (*p. 433*)

3. *S.I. Bangdiwala (USA)*
Using the agreement chart to examine observer bias. (*p. 31*)

4. *M. Montinaro (Italy)*
On a better approximation of power funtion of x^2 test. (*p. 301*)

5. *G. Nicolini (Italy)*
On some verifications of robustness of Student's test for samples drawn from mixture distributions. (*p. 315*)

6. *F. Malek (Iran)*
A study of ridge regression. (*p. 271*)

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9 Sept. (Wed.) 14:30 - 17:30 Room A (Ohtori - Higashi)

Topic / Thème 2

Development of statistics in Japan. Past experiences and present problems.

Le développement de la statistique au Japon. Expérience passée et problèmes actuels.

Organizer/Organisateur: *T. Nakamura (Japan)*
Chairperson/Président: *T. Nakamura (Japan)*

2.1 *Y. Matsuda (Japan)*
Historical development of Japanese statistics.

2.2 *H. Kudo (Japan)*
Statistical system of Japan.

2.3 *A. Asai (Japan)*
Problems of survey techniques in Japanese official statistics.

2.4 *K. Tsujimura, M. Kuroda (Japan)*
An appraisal of the Japanese economic statistical data from viewpoints of user: measurements of sectoral output and inputs.

Discussants/Discussiants: *M. Beyene (Ethiopia)*
T.N. Güner (Turkey)
T.A. Mijares (Philippines)

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9 Sept. (Wed.) 14:30 - 17:30 Room F (Zuiun II and III)

Topic / Thème 23

New developments in time series modelling and analysis.

Développements récents de la modélisation et de l'analyse des séries chronologiques.

Organizer/Organisateur: *D.F. Nicholls (Australia)*
Chairperson/Président: *D.F. Nicholls (Australia)*

23.1 *A.F.M. Smith (UK)*
Strategies for modelling, detecting and accommodating outliers in time series. *(Cancelled)*

23.2 *R.H. Jones (USA)*
Serial correlation in unbalanced mixed models.

23.3 *P.J. Diggle (UK), S.L. Zeger (USA)*
Modelling endocrinological time-series.

Discussants/Discussiants: *M.A. Cameron (Australia)*
G. Kitagawa (Japan)

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9 Sept. (Wed.) 14:30 - 17:30 Room B (Ohtori - Naka)

Topic / Thème 27

Survey processing on microcomputers.

Traitement des enquêtes sur micro-ordinateurs.

Organizers/Organisateurs: *B.N. Diskin (USA)*
T. Walczak (Poland)

Chairpersons/Présidents: *B.N. Diskin (USA)*
T. Walczak (Poland)

27.1 *J.P. Cushing (USA)*
Processing the demographic and health surveys: the micro approach.

27.2 *A.K.M.G. Rabbani, A. Baten (Bangladesh)*
Application of micro-computers in the field of statistics - Bangladesh experience.

27.3 *A. Donda (GDR)*
MC as a tool for the rationalization of statistical survey processing.

Discussants/Discussiants: *I.P. Fellegi (Canada)*
W.J. Keller (Netherlands)
R. Hanenberg (Thailand)
M. Podehl (Canada)

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9 Sept. (Wed.) 14:30 - 16:10 Room G (Yakumo)

Topic / Thème 115

Problems in designing case-control studies.

Problèmes en plan d'une étude par cas-contrôle.

Organizer/Organisateur: *J.L. Gastwirth (USA)*
Chairperson/Président: *P. Armitage (UK)*

115.1 *E.J. Harner (USA)*
Designing a matched case-control study of occupational fatalities. *(p. 159)*

115.2 *T. Yanagawa (Japan)*
Semiparametric method in a case-control study. *(p. 485)*

115.3 *C.E. Franti, A.D. Wiggins, J.F. Kraus (USA)*
Improved estimates of discordance ratios in twin studies. *(p. 125)*

115.4 *N. Keiding, C. Holst, A. Green (Denmark)*
Retrospective calculation of diabetes incidence from information in a current prevalent population and historical mortality. *(p. 225)*

115.5 *S. Akiba (Japan)*
Case-control studies in the field of cancer epidemiology in Japan. *(p. 11)*

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9 Sept. (Wed.) 14:30 - 15:30 Room I (Ryoun)

Topic / Thème 135

Multivariate analysis (II).

Analyse multivariante (II).

Chairperson/Président: *P.A. Lachenbruch (USA)*

135.1 *P. Ghosh (USA)*
On stable laws in multidimension. *(p. 139)*

135.2 *J.T. Lee, B.C. Kim (Korea)*
A new approach for the W-matrix. *(p. 253)*

135.3 *M. Singh (India), G.K. Kanji (UK)*
Fitting non-linear model with errors in both variables. *(p. 413)*

By title *D.S. Tracy (Canada), K.G. Jinadasa (USA)*
Matrix derivatives in polynomial regression. *(p. 449)*

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9 Sept. (Wed.) 15:50 - 17:10 Room I (Ryoun)

Topic / Thème 119

Medical statistics (I).

Statistique médicale (I).

Chairperson/Président: *P.K. Sen (India)*

119.1 *S. Milani, A. Bossi, E. Marubini (Italy)*
Longitudinal standards and missing data: comparison between different linear models applied to growth of babies up to 3 years. *(p. 293)*

119.2 *T. Shohoji, H. Sasaki, K. Kanefuji (Japan)*
Growth patterns of Japanese stature. *(p. 405)*

119.3 *M. Momiyama (Japan)*
Historical changes of seasonality in human mortality. *(p. 299)*

119.4 *M.A.A. Moussa (Egypt)*
A system for determination of a clinical trial size and power. (*p. 305*)

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9 Sept. (Wed.) 14:30 - 16:10 Room H1 (Seiun I)

Topic / Thème 122

Demography.

Démographie.

Chairperson/Président: *R.A. Horváth (Hungary)*

122.1 *S. Hadživuković (Yugoslavia)*
On the accuracy of demographic projections. (*p. 155*)

122.2 *J. Malačič (Yugoslavia)*
Some specific problems of the demographic statistics for elderly population. (*p. 269*)

122.3 *K. Uemura (Japan)*
Sex differentials in mortality - application of the excess mortality ratio with reference to the lowest age-sex-specific death rates among countries. (*p. 455*)

122.4 *T.T. Huang (Taiwan)*
A study of changes in population distribution and household structure in newly industrializing countries - a case study of Taiwan. (*p. 175*)

122.5 *H. Mehdizadeh-Ashrafi (Iran)*
Population migration problem in sample cities in Iran. (*p. 283*)

By title *W.J. Bühler (FRG)*
Models of interacting populations with disasters. (*p. 51*)

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9 Sept. (Wed.) 14:30 - 15:50 Room H2 (Seiun II)

Topic / Thème 113

Early stopping in medical studies.

Arrêt prématuré des études médicales.

Organizer/Organisateur: *P.K. Sen (India)*
Chairperson/Président: *T. Shohoji (Japan)*

113.1 *P.K. Sen (India)*
Early stopping in medical studies: general introduction and basic problems. (*p. 395*)

113.2 *D.N. Geary, P. Armitage (UK)*
Sequential testing in clinical trials with serially correlated data. (*p. 137*)

113.3 *A.P. Basu, M.S. Alam (USA)*
Testing whether new is better than used. (*p. 39*)

113.4 *S.S. Gupta, T. Liang (USA)*
On Bayes selection rules for the best exponential population with Type-I censored data. *(p. 153)*

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9 Sept. (Wed.) 16:10 - 17:30 Room H2 (Seiun II)

Topic / Thème 141

Distribution (II).

Distribution (II).

Chairperson/Président: *R.V. Hogg (USA)*

141.1 *K.O. Bowman (USA), L.R. Shenton (UK)*
Power transformation of the sample kurtosis. *(p. 49)*

141.2 *S.B. Provost (Canada)*
On the ratio of sums of gamma variates. *(p. 355)*

141.3 *T.-Y. Hwang (Taiwan)*
On the sampling distribution of signal to noise ratio under exponential distribution. *(p. 181)*

141.4 *J. Panaretos (Greece)*
On the relationship of the stuttering generalized Waring distribution to the generalized Poisson distribution. *(p. 341)*

By title *A. Amidi (Iran)*
La distribution binomiale négative généralisée. *(p. 17)*

By title *R. Cagiano de Azevedo (Italy)*
Synchronisme et retards: note statistique sur la succession des événements. *(p. 55)*

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9 Sept. (Wed.) 14:30 - 17:30 Room C (Ohtori - Nishi)

Poster meeting / Réuion d'affichage 2

Socio-economic studies.

Recherches socio-économiques.

7. *G. Gozzi (Italy)*
Comparing the quality of life in a set of Italian towns. *(p. 145)*

8. *S. Zani (Italy)*
Comparing partitions of geographical areas. *(p. 499)*

9. *T. Ishihara, H. Fujii, H. Takahashi, M. Ihara, H. Takeda (Japan)*
Distributed data management system for official statistics in L.D.C. government. *(p. 197)*

10. *P.J.E. Pange, E.T. Lekkas (Greece)*
An analysis of road traffic accidents in Greece. *(p. 343)*

11. *L.L. Conquest (USA)*
Statistical analysis of aquatic toxicity data. *(p. 77)*

12. *M. Hashimoto (Japan)*
Absolutization of contributions to rate of change. (*p. 165*)

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10 Sept. (Thur.) 14:30 - 17:30 Room A (Ohtori - Higashi)

Topic / Thème 5

Statistical techniques for improvement of quality and productivity.

Techniques statistiques pour l'amélioration de la qualité et de la productivité.

Organizer/Organisateur: *T. Okuno (Japan)*
Chairperson/Président: *T. Okuno (Japan)*

5.1 *G.E.P. Box (UK)*
The signal to noise ratio and transformation.

5.2 *M.G. Vigier (France)*
Plans d'expériences - une nouvelle méthode, simple et générale pour la détermination du modèle et l'optimatisation de la réponse.

5.3 *T. Yoshizawa (Japan)*
Exploratory data analysis in the development stage of new products.

Discussants/Discussiants: *N. Kettaneh (USA)*
T. Haga (Japan)

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10 Sept. (Thur.) 14:30 - 17:30 Room B (Ohtori - Naka)

Topic / Thème 20

Advances in data banks and network. Building and management.

Progrès dans la construction et la gestion des banques de données et des réseaux.

Organizer/Organisateur: *J.-L. Bodin (France)*
Chairperson/Président: *J.-L. Bodin (France)*

20.1 *B.M. Fitzpatrick, N.J.R. Williams (Australia)*
Experience with ADABAS at the Australian Bureau of Statistics.

20.2 *T. Walczak (Poland)*
Statistical databanks in the countries of centrally-planned economies with special reference to Poland.

20.3 *M.M. Jambwa (Zimbabwe), L. Olsson (Sweden)*
Application of database technology in the African context.

20.4 *J.-M. Bouroche (France)*
Le développement de l'utilisation des données locales.

Discussants/Discussiants: *N. Lauro (Italy)*
H. Lutz (Austria)
N. Meite (Ivory Coast)

10 Sept. (Thur.) 14:30 - 17:30 Room F (Zuiun II and III)

Topic / Thème 24

Estimation from accelerated tests and short term tests in reliability and medicine.

Estimation à partir de tests accélérés et à court terme en fiabilité et en médecine.

Organizer/Organisateur: *R.A. Johnson (USA)*
Chairperson/Président: *Y. Mettal (USA)*

24.1 *G.K. Bhattacharyya (India)*
Parametric models and inference procedures for accelerated life tests.

24.2 *R.K.W. Viertl (Austria)*
Bayesian inference in accelerated life testing.

24.3 *B.H. Margolin (USA)*
Short-term tests for genetic toxicity: the statistical imperative.

Discussants/discussiants: *B.L.S. Bergman (Sweden)*
N.D. Singpurwalla (India)

10 Sept. (Thur.) 14:30 - 15:50 Room G (Yakumo)

Topic / Thème 129

Official statistics and surveys (I).

Statistiques officielles et enquêtes (I).

Chairperson/Président: *S. Nagayama (Japan)*

129.1 *R.D. Tortora, F.A. Vogel (USA)*
Standards for official statistics. (*p. 447*)

129.2 *L. Boubkraoui (Morocco)*
L'enseignement de la statistique présentation du cas I.N.S.E.A. (*p. 47*)

129.3 *J. Asgari (Iran)*
The survey of statistical needs in the Islamic Republic of Iran. (*p. 21*)

129.4 *L.B. Nordberg (Finland)*
On the statistical analysis of income and consumption distributions. (*p. 321*)

By title *L. Roveri (Italy)*
Multipurpose household survey programme in Italy. (*p. 379*)

10 Sept. (Thur.) 16:00 - 17:40 Room G (Yakumo)

Topic / Thème 124

Price indices.

Indices de prix.

Chairperson/Président: *T. Mizoguchi (Japan)*

124.1 *J. Fourastié (France)*
Méthodologie des comparaisons de prix: le prix réel ou salarial. *(p. 121)*

124.2 *N.T. Jazairi (Canada)*
The specification and combination of index number formulae. *(p. 203)*

124.3 *G. Ferrari (Italy)*
The estimation of variability of consumer price indices by household size caused by budget surveys in Italy. *(p. 111)*

124.4 *H. Kobayashi (Japan)*
Survey of business index based on "zonal proportion principle". *(p. 239)*

By title *M.J. Mojarrad, A. Monajemi (Iran)*
An approach to the problem of dual market prices. *(p. 297)*

By title *R.P. Srivastava (Sierra Leone)*
International comparisons of prices using traditional index numbers. *(p. 423)*

10 Sept. (Thur.) 14:30 - 17:30 Room I (Ryoun)

Topic / Thème 110

Timeliness and accuracy in preliminary estimates and revisions of economic data.

Précocité et précision des premières estimations et révision des informations économiques.

Organizer/Organisateur: *U. Trivelkato (Italy)*
Chairperson/Président: *U. Trivellato (Italy)*

110.1 *S.O. Adamu (Nigeria)*
Timeliness and accuracy of GDP/GNP preliminary estimates and revisions: situation in developing countries. *(p. 3)*

110.2 *B. Barta (Hungary)*
Timeliness versus accuracy in preliminary estimates and revision of social data. *(p. 35)*

110.3 *G. Marliani (Italy)*
The accuracy of provisional estimates of national account data. *(p. 275)*

110.4 *G. Forbrig (GDR)*
Timeliness and accuracy of monthly data of industrial enterprises. *(p. 119)*

110.5 *Z. Kenessey (USA)*
The U.S. industrial production index: the experience regarding timeliness and accuracy. *(p. 229)*

110.6 *S. Linacre, D.J. Trewin (Australia)*
Investigating the accuracy of preliminary capital expenditure estimates. *(p. 261)*

110.7 *O.W. Winkler (USA)*
The effect of data obsolescence on economic forecasting - a special case of timeliness. *(p. 473)*

110.8 *T.A. Mijares (Philippines)*
On precoded values in economic surveys. *(p. 289)*

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10 Sept. (Thur.) 14:30 - 17:30 Room H1 (Seiun I)

Open meeting / Réunion ouverte 1

ISIRC: ISI Research Programme.

Open meeting / Réunion ouverte 2

World Bank: Project on Assessment of Social Dimensions of Structural Change in Sub-Saharan Countries.

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10 Sept. (Thur.) 14:30 - 17:30 Room H2 (Seiun II)

Topic / Thème 117

Asymptotic expansions and approximations of statistics (I).

Expansions asymptotiques et approximations des statistiques (I).

Organizer/Organisateur: *R. Shimizu (Japan)*
Chairperson/Président: *J. Sethuraman (India)*

117.1 *N.R. Chaganty, S. Sabnis (USA)*
Saddle point approximations for ratio statistics. *(p. 57)*

117.2 *A.K. Gupta, D.K. Nagar (India)*
Asymptotic expansion of the nonnull distribution of likelihood ratio statistic for testing multisample sphericity. *(p. 147)*

117.3 *T. Hayakawa (Japan)*
On the distribution of some statistic under elliptical population. *(p. 167)*

117.4 *N. Sugiura (Japan), M.T. Naing (Burma)*
Improved estimators for the location of double exponential distribution. *(p. 427)*

117.5 *Y.P. Chaubey (Canada)*
Edgeworth expansions with mixtures and applications. *(p. 63)*

117.6 *H. Dinges (FRG)*
Theory of Wiener germs: a remark on tail probabilities. *(p. 93)*

117.7 *Y. Fujikoshi, R. Shimizu (Japan)*
Asymptotic expansions of some mixtures of the multivariate normal distribution and their error bounds. (*p. 133*)

117.8 *Kei Takeuchi, A. Takemura (Japan)*
Properties of Cornish-Fisher expansions. (*p. 435*)

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11 Sept. (Fri.) 9:00 - 12:00 Room A, B (Ohtori-Higashi and Naka)

Topic / Thème 6

Papers by special invitation of the President.

Communications sur invitation spéciale du Président.

Organizer/Organisateur: *S. Moriguti (Japan)*
Chairperson/Président: *S. Moriguti (Japan)*

6.1 Mahalanobis Lecture:
S. Amari (Japan)
Differential geometry in statistical inference.

6.2 Delatour Lecture:
E. Malinvaud (France)
Des statistiques aux projections.

6.3 Rice Lecture:
W.E. Deming (USA)
On the statistician's contribution to quality.

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11 Sept. (Fri.) 14:30 - 17:30 Room A (Ohtori - Higashi)

Topic / Thème 9

Master samples in national household surveys.

Echantillons-maîtres dans les enquêtes nationales auprès des ménages.

Organizer/Organisateur: *A.K.M.G. Rabbani (Bangladesh)*
Chairperson/Président: *A.K.M.G. Rabbani (Bangladesh)*

9.1 *R. Torene, L.G. Torene (USA), M.Z. Hoque (Bangladesh)*
The practical side of using master samples: the Bangladesh experience.

9.2 *M. Tin (Burma), G. Mandishona (Zimbabwe)*
Master sample used in national household surveys of Zimbabwe.

9.3 *T.B. Jabine (USA)*
Some considerations in designing a programme of household surveys.

Discussants/Discussiants: *G. Kalton (UK)*
B.A. Carlson (USA)

11 Sept. (Fri.) 14:30 - 17:30 Room B (Ohtori - Naka)

Topic / Thème 17

Problems of and approaches to analysing large data sets.

Problèmes et moyens de l'analyse des grands ensembles de données.

Organizers/Organisateurs: *C. Arvas (Sweden)*
A.M. Herzberg (Canada)

Chairpersons/Présidents: *C. Arvas (Sweden)*
A.M. Herzberg (Canada)

17.1 *U. Grenander (Sweden)*
Mathematics motivated by emergence of different kinds of very powerful computers.

17.2 *Luo Jiyu, Ding Diqing, Zhang Weimin (China)*
Problems in constructing the regional model life tables of Sichuan Province in China based upon China's third population census data and methods to solve these problems.

17.3 *G.C. Tiao (USA)*
Analysis of tropospheric and stratospheric ozone data for trend detection.

Discussants/Discussiants: *I.O. Thomsen (Norway)*
A.J. Petkau (Canada)

11 Sept. (Fri.) 14:30 - 17:30 Room F (Zuiun II and III)

Topic / Thème 22

Recursive procedures for time sequenced data.

Procédures récursives pour les données échelonnées dans le temps.

Organizer/Organisateur: *G. Lindgren (Sweden)*
Chairperson/Président: *G. Lindgren (Sweden)*

22.1 *P.J. Green, D.M. Titterington (UK)*
Recursive methods in image processing.

22.2 *W.K. Härdle (FRG)*
Sequential kernel smoothing for estimation of zeros and location of extrema of regression functions.

22.3 *H. Sakai (Japan)*
Several architectures for recursive least squares filtering.

Discussants/Discussiants: *N.L. Hjort (Norway)*
G. Kitagawa (Japan)

11 Sept. (Fri.) 14:30 - 16:10 Room G (Yakumo)

Topic / Thème 106

Handling missing data in surveys.

Comment prendre en compte les données manquantes dans les enquêtes.

Organizer/Organisateur: *R.J.A. Little (USA)*
Chairperson/Président: *R.J.A. Little (USA)*

106.1 *H. Nisselson, P.D. Williams (USA)*
Methodology for missing data in the U.S. national health and nutrition examination survey. (···)

106.2 *S. Laaksonen, A. Ekholm (Finland)*
Correcting for nonresponse by regression modelling in the Finnish household survey. *(P. 251)*

106.3 *A. Ekholm, S. Laaksonen (Finland)*
Correcting for nonresponse by response propensity stratification in the Finnish household survey. *(P. 101)*

106.4 *P.S.R.S. Rao (India)*
Ratio and regression estimators with subsampling the nonrespondents. *(P. 361)*

106.5 *N. Schenker, K.M. Wolter (USA)*
Handling missing data in coverage measurement surveys. *(P. 393)*

11 Sept. (Fri.) 16:30 - 17:30 Room G (Yakumo)

Topic / Thème 130

Official statistics and surveys (II).

Statistiques officielles et enquêtes (II).

Chairperson/Président: *B.A. Bailar (USA)*

130.1 *J. Ondora (Kenya)*
Appropriateness of using same household for various surveys. *(P. 333)*

130.2 *J.I. García-Ramos (Spain)*
The official statistics in an autonomous region without statehood: the Basque experience. *(P. 135)*

130.3 *G. Silva, A. González Villalobos (Brazil)*
Brazil's current agricultural survey. *(P. 411)*

11 Sept. (Fri.) 14:30 - 16:10 Room I (Ryoun)

Topic / Thème 116

Confidentiality protection in national statistical offices.

Protection confidentielle des bureaux nationaux de statistiques.

Organizer/Organisateur: *L.H. Cox (USA)*
Chairperson/Président: *R. Barnes (UK)*

116.1 *L.H. Cox (USA)*
New results in disclosure avoidance for tabulations. *(P. 83)*

116.2 *W.J. Keller, J.G. Bethlehem (Netherlands)*
Confidentiality protection of micro data. *(P. 227)*

116.3 *O. Frank (Sweden)*
Relative information and statistical disclosure. *(P. 123)*

116.4 *J. Kühn, M. Radtke (FRG)*
Automated anonymization procedures for short tape records. *(P. 245)*

116.5 *E. Rapaport (Sweden), D.J. Trewin (Australia)*
Using encryption to protect confidentiality. *(P. 363)*

Discussant/Discussiant: *G. Nathan (Israel)*

11 Sept. (Fri.) 14:30 - 16:00 Room H1 (Seiun I)

Open meeting / Réunion ouverte 3

Report of the Ad Hoc Committee on the Preparation of the Scientific Programmes at ISI Sessions.

11 Sept. (Fri.) 16:10 - 17:10 Room H1 (Seiun I)

Topic / Thème 127

Time series (I).

Série chronologique (I).

Chairperson/Président: *T.W. Anderson (USA)*

127.1 *I.V. Basawa (USA), L. Billard (Australia)*
Large sample inference for a generalized regression model with multiple observations. *(P. 37)*

127.2 *R.J. Bhansali (UK)*
Estimation of the more-than-one-step prediction variance of a stationary nondeterministic process. *(P. 45)*

127.3 *M.B. Okamoto (Japan)*
Long-run self-dependency of the foreign-exchange rate: an empirical study using FFGN model. *(P. 331)*

11 Sept. (Fri.) 14:30 - 15:50 Room 112 (Seiun II)

Topic / Thème 132

Testing hypothesis (I).

Test d'hypothèse (I).

Chairperson/Président: *M. Eaton (USA)*

132.1 *F. Pesarin (Italy)*
On conditional simulation and the combination of dependent tests. (· · ·)

132.2 *M. Westberg (Sweden)*
Adaptive methods of combining p-values. *(P. 467)*

132.3 *Y. Ukita, K. Noda (Japan)*
Testing hypotheses on generalized linear models in ANOVA. *(P. 459)*

132.4 *M. Frisén (Sweden)*
Evaluations of some methods for statistical surveillance. *(p. 127)*

By title *D. Alemayehu (USA)*
A bootstrap test for location in symmetric distributions. *(p. 15)*

By title *A.F. Ifram (Jordan)*
Posterior weighting of hypotheses. *(p. 191)*

11 Sept. (Fri.) 16:10 - 17:30 Room 112 (Seiun II)

Topic / Thème 136

Stochastic process (I).

Procédé stochastique (I).

Chairperson/Président: *S. Zacks (USA)*

136.1 *R. Klein (Brazil), S.J. Press (USA)*
Spatial correlation in Bayesian classification. *(p. 235)*

136.2 *J.P. Rasson, M. Hermans, D. Weverbergh (Belgium)*
Testing the uniformity of a linear point process in a circle. *(p. 365)*

136.3 *T. Thedéen (Sweden)*
Reconstruction of distorted point processes. *(p. 441)*

136.4 *M.F. Fontes de Sousa (Portugal)*
Un plan de contrôle avec inspections aléatoires. *(p. 117)*

12 Sept. (Sat.) 9:00 - 12:00 Room A (Ohtori - Higashi)

Topic / Thème 3

Analysis of historical records. Comparative historical demography.

Analyse des archives historiques. Démographie historique comparative.

Organizer/Organisateur: *Kei Takeuchi (Japan)*
Chairperson/Président: *Kei Takeuchi (Japan)*

3.1 *J.-N. Biraben, A. Blum (France)*
Population trends in France, 1500 to 1800. Comparison with other Western and Eastern countries.

3.2 *A. Hayami (Japan)*
Population trends in Tokugawa Japan: 1600 - 1868.

3.3 *S. Yabuki (Japan)*
Rapid population growth in 17-18th century China.

Discussants/Discussiants: *R.A. Horváth (Hungary)*
S. Kono (Japan)

12 Sept. (Sat.) 9:00 - 12:00 Room F (Zuiun II and III)

Topic / Thème 8

Measuring change from surveys.

Comment mesurer des évolutions à partir d'enquêtes?

Organizer/Orgaisateur: *G.J. Brackstone (Canada)*
Chairperson/Président: *G.J. Brackstone (Canada)*

8.1 *P. Narain, O.P. Kathuria, A.K. Srivastava (India)*
Measuring change in agricultural surveys.

8.2 *D.J. Trewin (Australia)*
Estimation of trends and time series models from continuing surveys.

8.3 *D. Holt, C.J. Skinner (UK)*
Components of change in surveys.

Discussants/Discussiants: *R.E. Fay (USA)*
J.N.K. Rao (Canada)

12 Sept. (Sat.) 9:00 - 12:00 Room B (Ohtori - Naka)

Topic / Thème 18

Statistical needs of developing countries.

Les besoins des pays en voie de développement en ce qui concerne la statistique.

Organizer/Organisateur: *T.A. Mijares (Philippines)*
Chairperson/Président: *T.A. Mijares (Philippines)*

18.1 *M.A. Sahib (Fiji)*
Development of statistical capability within official statistical agencies in the ESCAP region.

18.2 *F. Azorín, A. De Miguel (Spain)*
Computerization in the design and exploitation of censuses and surveys in developing countries.

18.3 *S.H. Park (Korea)*
The use of computers for statistical activities in developing countries.

Discussants/Discussiants: *Li Chengrui (China)*
L. Abdunnur (Iraq)
K.T. De Graft-Johnson (Ghana)
Y. Miura (Japan)
N.J.R. Williams (Australia)
I.S. Francis (New Zealand)
W. Seltzer (USA)

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12 Sept. (Sat.) 9:00 - 10:40 Room G (Yakumo)

Topic / Thème 101

Current issues in principles of statistical inference.

Problèmes actuels relatifs aux principes de l'inférence statistique.

Organizer/Organisateur: *P. McCullagh (UK)*
Chairperson/Président: *C.R. Rao (India)*

101.1 *P. Rigo (Italy)*
Fuzzy sets and vague prior information in statistical inference. (*p. 369*)

101.2 *M.L. Eaton (USA)*
Fair Bayes prediction. (...)

101.3 *E. Torgersen (Norway)*
Ordering of linear normal models. (*p. 445*)

101.4 *T. Yanagimoto (Japan)*
Possible superiority of the conditional MLE over the unconditional MLE. (*p. 487*)

101.5 *E.J. Wegman (USA)*
On randomness, determinism and computability. (*p. 465*)

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12 Sept. (Sat.) 11:00 - 12:00 Room G (Yakumo)

Topic / Thème 137

Stochastic process (II).

Procédé stochastique (II).

Chairperson/Président: *W. Vervaat (Netherlands)*

137.1 *S. Zacks (USA)*
Distributions of stopping times for Poisson processes with linear boundaries. *(p. 497)*

137.2 *S. Yokoyama, N. Miyawaki (Japan)*
On the estimation problem in the analysis of the time-dependent Poisson process. *(p. 493)*

137.3 *E. Willekens, J.L. Teugels (Belgium)*
Subordination of stationary processes. *(p. 471)*

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12 Sept. (Sat.) 9:00 - 10:40 Room I (Ryoun)

Topic / Thème 123

Statistical computing.

Calcul statistique.

Chairperson/Président: *W.S. Cleveland (USA)*

123.1 *K. Neumann (GDR)*
Some aspects of computer aided design of statistical information systems. *(p. 313)*

123.2 *A. Prat, J. Ginebra, J.M. Catot, J. Lores (Spain)*
Expert system for forecasting. *(p. 351)*

123.3 *Y. Baba (Japan)*
Distribution of linked vectors and its application to graphical analysis. *(p. 25)*

123.4 *B. Baldessari, F. Gallo (Italy)*
Bias in topographic mapping methods and the intrinsic inference model. *(p. 29)*

123.5 *P.A.L. Embrechts (Belgium), A.M. Herzberg (Canada)*
Generalizations of Andrew's plots. *(p. 103)*

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12 Sept. (Sat.) 9:00 - 9:40 Room H1 (Seiun I)

Topic / Thème 144

Statistical inference (I).

Inférence statistique (I).

Chairperson/Président: *J. Gani (Australia)*

144.1 *I.-S. Chang, C.A. Hsiung (Taiwan)*
Some asymptotic optimality results for censored data.

144.2 *K.-K. Chen, W.-T. Huang (Taiwan)*
Existence and strong consistency of minimum distance estimators. *(p. 65)*

12 Sept. (Sat.) 10:00 - 10:40 Room 111 (Seiun I)

Topic / Thème 103

Statistical methodology for studying the status of women (II).

Méthodologie statistique pour l'étude de la condition féminine (II).

Chairperson/Président: *M. Momiyama (Japan)*

103.1 *C.-F. Zhang (China)*
The system and the function of the indicators for studying the condition of women (in China). *(p. 501)*

103.2 *S. Sahli (Tunisia)*
La condition féminine en Tunisie. *(p. 381)*

12 Sept. (Sat.) 9:00 - 11:40 Room 112 (Seiun II)

Topic / Thème 143

Nonparamertrics.

Non-paramétrique.

Chairperson/Président: *J.C. Lee (Korea)*

143.1 *H.R. Künsch (Switzerland)*
Jackknife and bootstrap in dependent situations. *(p. 247)*

143.2 *G.E. Noether (USA)*
Sample size determination for Kruskal-Wallis and Friedman tests. *(p. 317)*

143.3 *J. Nyblom, H. Oja (Finland)*
Asymptotics for bivariate sign tests. *(p. 325)*

143.4 *H. Oja, J. Nyblom (Finland)*
On bivariate sign tests. *(p. 327)*

143.5 *M. Ichimura, C. Asano (Japan)*
Runs and ties test. *(p. 189)*

143.6 *M. Seoh (USA), M.L. Puri (India)*
Central limit theorems under alternatives for a class of nonparametric statistics. *(p. 397)*

143.7 *I. Mellin, T. Teräsvirta (Finland)*
Estimating the smoothing parameter in nonparametric regression. *(p. 285)*

14 Sept. (Mon.) 9:00 - 12:00 Room F (Zuiun II and III)

Topic / Thème 10

Variance estimation with complex samples.

Estimation de la variance avec échantillons complexes.

Organizer/Organisateur: *A.J. Scott (New Zealand)*
Chairperson/Président: *T.M.F. Smith (UK)*

10.1 *J.N.K. Rao (Canada), C.F.J. Wu (USA)*
Methods for standard errors and confidence intervals from sample survey data: some recent work.

10.2 *W.A. Fuller, D. Schnell, G. Sullivan, W.J. Kennedy (USA)*
Survey variance computations on the personal computer.

10.3 *K. Rust (USA)*
Practical problems in sampling error estimation.

Discussants/Discussiants: *K.M. Wolter (USA)*
C.J. Skinner (UK)

14 Sept. (Mon.) 9:00 - 12:00 Room A (Ohtori - Higashi)

Topic / Thème 11

The future of the population census.

L'avenir des recensements de population.

Organizer/Organisateur: *L. Herberger (FRG)*
Chairperson/Président: *L. Herberger (FRG)*

11.1 *P.A. Bounpane (USA)*
A sample census: a valid alternative to a complete count census?

11.2 *S. Johansson (Sweden)*
Statistics based on administrative records as a substitute or a valid alternative to a population census.

11.3 *A.M. Hallouda (Egypt)*
Census taking in developing countries. Problems and increasing demand.

Discussants/Discussiants: *Y. Miura (Japan)*
A.M. Abu-Nuwar (USA)

14 Sept. (Mon.) 9:00 - 12:00 Room B (Ohtori - Naka)

Topic / Thème 15

Artificial intelligence and expert systems in statistics.

Intelligence artificielle et systèmes experts en statistiques.

Organizer/Organisateur: *S.K. Apelt (GDR)*
Chairperson/Président: *S.K. Apelt (GDR)*

15.1 *W.A. Gale (USA)*
Student: a tool for constructing consultation systems in data analysis.

15.2 *F. González Martín, O. Hernández Valera, O. Lastra Rodríguez (Cuba)*
AI and expert systems in statistics: perspectives of using logic programming in statistical data processing. The Cuban experience.

15.3 *G. Barna (Hungary)*
Experimental expert system to assembling national balances in the Hungarian CSO.

Discussants/Discussiants: *S. Nordbotten (Norway)*
W.H. Du Mouchel (USA)
A. Prat-Bartes (Spain)

14 Sept. (Mon.) 9:00 - 10:20 Room G (Yakumo)

Topic / Thème 111

Analysis of circular data.

Analysis des données circulaires.

Organizer/Organisateur: *G.K. Kanji (UK)*
Chairperson/Président: *I. Yoshimura (Japan)*

111.1 *K.V. Mardia (UK)*
Statistics of directional data: an overview. *(p. 273)*

111.2 *D. Harrison, G.K. Kanji (UK)*
Analysis of variance for angular data. *(p. 163)*

111.3 *P.E. Jupp (UK)*
Residuals for directional data. *(p. 215)*

111.4 *M.J. Prentice (UK)*
Least squares and shatter cones: using sample principal axes to estimate small circles and ellipses on the sphere. *(p. 353)*

Discussant/Discussiant: *N.I. Fisher (Australia)*

14 Sept. (Mon.) 10:30 - 12:00 Room I (Ryoun)

Open meeting / Réunion ouverte 4

ISI Statistical Education Programme.

14 Sept. (Mon.) 9:00 - 10:20 Room H1 (Seiun I)

Topic / Thème 102

Statistical methodology for studying the status of women (I).

Méthodologie statistique pour l'étude de la condition féminine (I).

Organizer/Organisateur: *B.A. Carlson (USA)*
Chairperson/Président: *B.A. Carlson (USA)*

102.1 *R. Johnston, W. Seltzer, J. Vanek (USA)*
International issues in the development of statistics and indicators on women. *(p. 213)*

102.2 *Y. Lemel, C. Roy (France)*
Position sociale et statut féminin dans les activités quotidiennes. *(p. 255)*

102.3 *S. Nuss (Switzerland)*
Presenting statistics on women: communicating with charts and graphs. *(p. 323)*

102.4 *M.S. Fong (Italy)*
Monitoring women's work in agriculture. *(p. 115)*

14 Sept. (Mon.) 9:00 - 11:40 Room H2 (Seiun II)

Topic / Thème 139

Design of experiments.

Plan des expérimentations.

Chairperson/Président: *D. Dugue (France)*

139.1 *Z.W. Liu (China), H.J. Zheng (USA)*
An embedding theorem for incomplete block designs. *(p. 265)*

139.2 *Y. Fujii, T. Namikawa, S. Yamamoto (Japan)*
On three-symbol orthogonal arrays. *(p. 131)*

139.3 *Y. Hyodo, S. Yamamoto (Japan)*
Structure of balanced designs and atomic arrays. *(p. 185)*

139.4 *S. Yamamoto, K. Aratani (Japan)*
Bounds on number of constraints for balanced arrays. *(p. 483)*

139.5 *R.M. Loynes (UK)*
Diagnostics in designed experiments. *(p. 267)*

139.6 *I.N. Vuchkov, Z.M. Iliev, N.E. Manolov (Bulgaria)*
Design of experiments for three-component mixtures with phase transitions. (*p. 463*)

139.7 *F. Mikaeili (Iran)*
Simplex and D-optimum design. (*p. 291*)

By title *K. Afsarinejad (Iran)*
Circular balanced uniform repeated measurements designs. (*p. 5*)

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14 Sept. (Mon.) 9:00 - 12:00 Room C (Ohtori-Nishi)

Poster meeting / Réunion d'affichage 3

Multivariate analysis.

Analyse multivariante.

13. *T. Isogai (Japan)*
On testing multivariate normality. (*p. 199*)

14. *M. Kanazawa (Japan)*
On the ML classification distances. (*p. 219*)

15. *T. Tarumi, Y. Tanaka (Japan)*
Principle and methodology of SAM - sensitivity analysis in multivariate methods. (...)

16. *A. Giusti (Italy)*
Some applications of APL2 in multivariate statistical analysis. (*p. 141*)

17. *M.P. Martín-Guzmán, F. Cea (Spain)*
Diagnostics in categorical data modelling: an empirical application. (*p. 277*)

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14 Sept. (Mon.) 14:30 - 17:30 Room F (Zuiun II and III)

Topic / Thème 7

Best papers by recent graduates from developing countries.

Sélection des meilleures communications de jeunes diplômés de pays en voie de développement.

Organizer/Organisateur: *J. Gani (Australia)*
Chairperson/Président: *J. Gani (Australia)*

7.1 *K. Kumar (India)*
Identification of Autoregressive-Moving Average (ARMA) models using Padé approximations.

7.2 *M. Bhattacharyya (India)*
Superiority of randomised decisions in chance constrained programming (CCP).

7.3 *K.F. Famoye (Canada)*
Interval estimation for the restricted generalized Poisson distribution.

14 Sept. (Mon.) 14:30 - 17:30 Room A (Ohtori - Higashi)

Topic / Thème 12

Methodological issues in surveys for price indices.

Problèmes méthodologiques des enquêtes destinées à l'établissement des indices de prix.

Organizer/Organisateur: *B.M. Balk (Netherlands)*
Chairperson/Président: *B.M. Balk (Netherlands)*

12.1 *L. Biggeri, A. Giommi (Italy)*
On the accuracy and precision of the consumer price indices. Methods and applications to evaluate the influence of the sampling of households.

12.2 *C. Andersson, G. Forsman, J. Wretman (Sweden)*
On the measurement of errors in the Swedish consumer price index.

12.3 *S.G. Leaver, W.L. Weber, M.P. Cohen, K.P. Archer (USA)*
Item-outlet sample redesign for the 1987 U.S. consumer price index revision.

Discussants/Discussiants: *K.S. Banerjee (USA)*
G. Szilágyi (Hungary)

14 Sept. (Mon.) 14:30 - 17:30 Room B (Ohtori - Naka)

Topic / Thème 28

Statistical computing in the 90's. Impact of the fifth generation.

Le calcul statistique dans les années 90. Impact de la cinquième génération d'ordinateurs.

Organizer/Organisateur: *M.E. Muller (USA)*
Chairperson/Président: *M.E. Muller (USA)*

28.1 *W.H. Du Mouchel (USA)*
Experience with a statistics advisor for industrial scientists and engineers.

28.2 *R.W. Oldford (Canada), S.C. Peters, R.E. Welsch (USA)*
An object oriented approach.

28.3 *K. Yajima, N. Ohsumi (Japan)*
Statistical intelligent software for automatic classification.

Discussant/Discussiant: *K. Furukawa (Japan)*

14 Sept. (Mon.) 14:30 - 17:30 Room G (Yakumo)

Topic / Thème 104

Census evaluation (I).

Evaluation des recensements (I).

Organizer/Organisateur: *A. Lery (France)*
Chairperson/Président: *A. Lery (France)*

104.1 *R. Barnes (UK)*
Census evaluation: how good is the information that is collected. *(p. 33)*

104.2 *L.A. Beccaria, A. Minujin, A. Orsatti (Argentina)*
How population censuses measure economic characteristics in developing countries. *(p. 41)*

104.3 *I. Alam (Pakistan), L.H. Lewis (Australia)*
Asian and Pacific Census Programme 1975-1984: a review of the use of census to investigate demographic topics. *(p. 13)*

104.4 *R. Clairin, F. Gendreau (France)*
La qualité des données sur les effectifs de population en Afrique. *(p. 75)*

104.5 *C.Y. Choi, D.G. Steel, I. Castles (Australia)*
Adjusting census counts for under-enumeration: the Australian experience. *(p. 69)*

104.6 *N. Cressie (Australia)*
Estimating undercount in the U.S. decennial census. *(p. 85)*

104.7 *Y. Iifuchi, T. Katoh, W. Gokita (Japan)*
Completeness and accuracy of Japan's censuses after World War II. *(p. 193)*

104.8 *R.A. Horváth (Hungary)*
L'évaluation des recensements comme problème de démographie historique au point de vue de l'histoire scientifique. *(p. 171)*

14 Sept. (Mon.) 14:30 - 16:50 Room I (Ryoun)

Topic / Thème 118

Asymptotic expansions and approximations of statistics (II).

Expansions asymptotiques et approximations des statistiques (II).

Chairperson/Président: *R. Shimizu (Japan)*

118.1 *J.C. Abril (Argentina)*
Edgeworth expansion for the density of a function of statistics whose density admits an expansion. *(p. 1)*

118.2 *N.R. Chaganty (USA), J. Sethuraman (India)*
Strong large deviation and local limit theorems. *(p. 59)*

118.3 *M. Taniguchi (Japan)*
Higher order asymptotic sufficiency, asymptotic ancillarity and higher order asymptotic efficiency in time series analysis. *(p. 439)*

118.4 *P. Deheuvels (France), D. Pfeifer (FRG)*
Poisson approximation in different metrics - a semigroup approach. *(p. 89)*

118.5 *C.-G. Liu (China), K. Kawamura (Japan)*
Multivariate independent Bernoulli sequences and multivariate Poisson distribution. *(p. 263)*

118.6 *Y. Itoh (Japan)*
The minimum of gaps generated by one-dimensional random packing. *(p. 201)*

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14 Sept. (Mon.) 14:30 - 16:50 Room H1 (Seiun I)

Topic / Thème 120

Medical statistics (II).

Statistique médicale (II).

Chairperson/Président: *T. Yanagawa (Japan)*

120.1 *R.C. Gupta, R.A. Albanese (USA)*
Estimation of relative risk in epidemiological studies. *(p. 151)*

120.2 *D. Robinson (UK), S. Hinohara (Japan)*
A comparison of age trends in health risk factors between English and Japanese subjects. *(p. 371)*

120.3 *M.A. Coppini (Italy)*
An indicator of health conditions obtained through the disease distribution by duration. *(p. 81)*

120.4 *G.Y. Wong (USA)*
A stochastic network model with self choice: application to a cancer problem. (···)

120.5 *J.R. Thompson (USA)*
A model based examination of AIDS: causes and elimination. *(p. 443)*

120.6 *G.H. Reynolds, R.T. Rolfs, A.A. Zaidi, S.J. Kraus (USA)*
Decision analysis in treating resistant gonorrhea. *(p. 367)*

By title *P. Krishnan, E. Ng (Canada)*
A stochastic model of the age pattern of mortality from cardiovascular diseases. *(p. 243)*

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14 Sept. (Mon.) 14:30 - 17:10 Room H2 (Seiun II)

Topic / Thème 128

Time series (II).

Série chronologique (II).

Chairperson/Président: *H. Akaike (Japan)*

128.1 *T.W. Anderson (USA), R.P. Mentz (Argentina)*
Some results on exact maximum likelihood estimation in time series models. *(p. 19)*

128.2 *R. Dahlhaus (FRG)*
Small sample effects in time series analysis. *(p. 87)*

128.3 *R. Leppälä (Finland)*
On the estimation and usage of the high order autoregression. *(p. 259)*

128.4 *F.A. Pino, P.A. Morettin (Brazil), R.P. Mentz (Argentina)*
Modelling and forecasting linear combinations of time series. *(p. 349)*

128.5 *T.M.F. Smith, T.M. Brunsdon (UK)*
The time series analysis of compositional data. *(p. 417)*

128.6 *M. Huzii (Japan)*
Properties of predictors for seasonal time series. *(p. 179)*

128.7 *K.I. Juselius (Denmark)*
Identification of structural models for the seasonal component: some simulation results. *(p. 217)*

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14 Sept. (Mon.) 14:30 - 17:30 Room C (Ohtori - Nishi)

Poster meeting / Réunion d'affichage 4

Indices and others.

Indices et les autres.

18. *M.H. Farnoudi (Iran)*
The wholesale price index in Iran. *(p. 109)*

19. *S. Afshar (Iran)*
Changing the homeownership component of the consumer price index to rental equivalence. *(p. 7)*

20. *D.V. Chopra (USA)*
Balanced arrays and their applications to factorial designs. *(p. 71)*

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15 Sept. (Tues.) 9:00 - 12:00 Room A (Ohtori - Higashi)

Topic / Thème 13

Effects of mode of data collection on survey response.

L'influence des modes de collecte des données sur les réponses à une enquête.

Organizer/Organisateur: *D.A. Lievesley (UK)*
Chairperson/Président: *D.A. Lievesley (UK)*

13.1 *F. Madsen (Denmark)*
Some differences in the quality of data obtained by telephone- and in person interviews.

13.2 *G. Nathan (Israel)*
The use of linear models and misclassification models to assess response error effects of mode of data collection.

13.3 *D.A. Binder, J.-P. Morin (Canada)*
The use of activities of daily living questions to screen for disabled persons in a household survey.

Discussants/Discussiants: *Y. Lemel (France)*
P. Maxwell (New Zealand)

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15 Sept. (Tues.) 9:00 - 12:00 Room B (Ohtori - Naka)

Topic / Thème 16

Statistical graphics.

La représentation graphique en statistique.

Organizer/Organisateur: *K. Wakimoto (Japan)*
Chairperson/Président: *K. Wakimoto (Japan)*

16.1 *B.S. Everitt (UK)*
Graphical displays of complex data - scientific tools or simply art for art's sake?

16.2 *R.A. Becker, W.S. Cleveland, G. Weil* (USA)
The use of brushing and rotation for data analysis.

16.3 *N.I. Fisher (Australia)*
Graphical methods in statistics: current and prospective views.

Discussants/Discussiants: *M. Goto (Japan)*
J.C. Lee (Korea)

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15 Sept. (Tues.) 9:00 - 12:00 Room F (Zuiun II and III)

Topic / Thème 29

Small area statistics.

Les statistiques relatives à de petites zones géographiques.

Organizer/Organisateur: *A. Marton (Hungary)*
Chairperson/Président: *A. Marton (Hungary)*

29.1 *R.E. Fay (USA)*
Small domain estimation through components of variance models.

29.2 *E. Spjøtvoll, I.O. Thomsen (Norway)*
Application of some empirical Bayes methods to small area statistics.

29.3 *G.H. Choudhry, M.A. Hidiroglou (Canada)*
Small area estimation: some investigations at Statistics Canada.

Discussants/Discussiants: *M.S. Kovačević (Yugoslavia)*
D.J. Trewin (Australia)

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15 Sept. (Tues.) 9:00 - 10:40 Room G (Yakumo)

Topic / Thème 108

Repeated measurement and crossover design.

Mesures répétées et plans d'expérience en "cross-over".

Organizer/Organisateur: *P. Armitage (UK)*
Chairperson/Président: *P. Armitage (UK)*

108.1 *J.C. Bailar III (USA)*
Crossover designs in clinical research. (*p. 27*)

108.2 *A. Azzalini, A. Forcina (Italy)*
Repeated measurements with hierarchycal error structure. (*p. 23*)

108.3 *H. Uesaka (Japan)*
Factorial analysis of ordered categorical responses from a repeated measures experiment. (*p. 457*)

108.4 *M. Kuwada (Japan)*
Balanced fractional 3^m factorial designs of resolution V with blocks. (*p. 249*)

108.5 *D.O. Stram, L.J. Wei (USA)*
Analysis of repeated measures data using generalized linear models, methods and software. (*p. 425*)

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15 Sept. (Tues.) 9:00 - 10:20 Room I (Ryoun)

Topic / Thème 105

Census evaluation (II).

Evaluation des recensements (II).

Chairperson/Président: *Y. Miura (Japan)*

105.1 *L. Herberger (FRG)*
The future of the population census. (···)

105.2 *M. Sicron, Y. Hite, B. Lasman (Israel)*
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (*p. 409*)

105.3 *P.K. Sircar (India)*
Strategy of the macro and micro census (population) data and primitive tribal development. (*p. 415*)

105.4 *S. Kawasaki (Japan)*
A new input device for data processing of the 1990 Population Census. (*p. 223*)

15 Sept. (Tues.) 9:00 - 10:40 Room H1 (Seiun I)

Topic / Thème 121

Hazard analysis.

Analyse du hasard.

Chairperson/Président: *D.A. Pierce (USA)*

121.1 *C.A. Hsiung, I.-S. Chang (Taiwan)*
On the model of censored survival data with staggered entry.(*p. 173*)

121.2 *T. Nakamura (Japan)*
Partial likelihood adjusting for covariate measurement error in Cox regression model. (*p. 311*)

121.3 *T. Sato (Japan)*
Another symmetric variance estimator for the Mantel-Haenszel odds ratio. (*p. 391*)

121.4 *W.-Y. Tsai (USA)*
Estimation of bivariate density and hazard gradient from bivariate censored data. (*p.* 451)

121.5 *E. Yamamoto, T. Yanagimoto (Japan)*
Litter effect to dose response curve estimation. (*p.* 481)

15 Sept. (Tues.) 9:00 - 11:40 Room H2 (Seiun II)

Topic / Thème 146

Miscellaneous.

Miscellanées.

Chairperson/Président: *L.K. Chan (Canada)*

146.1 *M. Moore (Canada)*
Estimation d'un contour convexe à l'aide de points intérieurs et extérieurs. (*p.* 303)

146.2 *Y. Escoufier (France)*
Contribution au suivi des évolutions dans les enquêtes d'opinion. (*p.* 107)

146.3 *T. Hamada (Japan)*
A two-armed bandit problem with unobservable probability. (*p.* 157)

146.4 *H. Sakamoto (Japan)*
On the conditions for the existence of the so-called "universe" in statistical research. (*p.* 385)

146.5 *Z. Mu (China)*
The statistical graphs by Yang Jia in the Southern Song Dynasty of China. (*p.* 307)

146.6 *F.C. Leone, R.K. Spoeri (USA)*
Complementary roles of the international and national statistical societies in the development of the profession. (*p.* 257)

146.7 *Kiyoshi Takeuchi (Japan)*
On sampling survey in Japan and Russia during the first quarter of the 20th century. (···)

By title *A.C. Rogers (USA)*
Cluster analysis pertaining to the underground storage tank program of the Environmental Protection Agency. (*p.* 373)

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16 Sept. (Wed.) 9:00 - 12:00 Room A (Ohtori - Higashi)

Topic / Thème 14

Statistical education in government and industry.

L'enseignement de la statistique dans l'administration et l'industrie.

Organizer/Organisateur: *C.A. Van Horn (USA)*
Chairperson/Président: *R.M. Loynes (UK)*

14.1 *L. Solomon (USA)*
Simulating the process: survey training at the Census Bureau.

14.2 *S.A. Conrad (UK)*
Assessing and meeting the need for statistical education in organizations.

14.3 *O.O. Ajayi, J.B. Coker (Nigeria)*
Establishing and innovating statistical education programme for Nigeria's statistical system.

Discussant/Discussiant: *C. Ssewankambo (Zambia)*

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16 Sept. (Wed.) 9:00 - 12:00 Room B (Ohtori - Naka)

Topic / Thème 21

Statistical methods for spatial image analysis.

Méthodes statistiques pour l'analyse d'images spatiales.

Organizer/Organisateur: *B.D. Ripley (UK)*
Chairperson/Président: *B.D. Ripley (UK)*

21.1 *S. Geman, D.E. McClure (USA)*
Statistical methods for tomographic image reconstruction.

21.2 *N.L. Hjort, E. Mohn (Norway)*
Topics in the statistical analysis of remotely sensed data.

Discussants/Discussiants: *L. Lionetti (Italy)*
P.J. Green (UK)

16 Sept. (Wed.) 9:00 - 12:00 Room F (Zuiun II and III)

Topic / Thème 30

New developments in the statistical methodology in chemistry.

Développements récents de la méthodologie statistique en chimie.

Organizer/Organisateur: *R. Sundberg (Sweden)*
Chairperson/Président: *R. Sundberg (Sweden)*

30.1 *S. Wold, M. Sjöström, S. Hellberg (Sweden)*
Chemometrics: multivariate analysis and design.

30.2 *H. Martens (Norway)*
Multivariate calibration: combining harmonies from an orchestra of instruments into reliable predictors of chemical composition.

30.3 *E. Sanchez, B.R. Kowalski (USA)*
Chemometrics in the future: higher order tensors.

Discussants/Discussiants: *P.J. Brown (UK)*
A. Takemura (Japan)

16 Sept. (Wed.) 9:00 - 10:00 Room G (Yakumo)

Topic / Thème 133

Testing hypothesis (II).

Test d'hypothèse (II).

Chairperson/Président: *G.E. Noether (USA)*

133.1 *A. Jensen (Denmark)*
Hypothesis testing: uneven information in the game between the statistician and nature. The choice between two sets of hypothesis. (*p. 205*)

133.2 *V.N. Murty, B.H. Bissinger (USA)*
Testing hypotheses with confidence intervals. (*p. 309*)

133.3 *O. Miyatake, M. Ichimura (Japan)*
Comparison of tests using the single and the paired x^2-values. (*p. 295*)

16 Sept. (Wed.) 10:20 - 11:20 Room G (Yakumo)

Topic / Thème 142

Distribution (III).

Distribution (III).

Chairperson/Président: *H.R. Künsch (Switzerland)*

142.1 *B. Epstein (Israel)*
A class of particle size distributions arising from a breakage process. (*p. 105*)

142.2 *D. Dugue (France)*
Quelques réflexions sur le foto national français. (*p.. 99*)

142.3 *S. Tsukibayashi (Japan)*
Further discussions on the range and its concomitant. (*p. 453*)

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16 Sept. (Wed.) 9:00 - 11:20 Room I (Ryoun)

Topic / Thème 138

Estimation.

Estimation.

Chairperson/Président: *B. Harris (USA)*

138.1 *M. Akahira, Kei Takeuchi (Japan)*
Second and third order asymptotic efficiency in terms of asymptotic distributions of the sequential maximum likelihood estimation procedures. (*p. 9*)

138.2 *Y. Shibata (Japan)*
Estimation of parameters and some characteristic values of three-parameter Weibull distribution. (*p. 403*)

138.3 *A. Mineo (Italy)*
The estimation of median. (···)

138.4 *M.R. Meshkani (Iran)*
Smoothing raw scores via empirical Bayes procedure. (*p. 287*)

138.5 *E.J. Pahkinen (Finland)*
Robustifying estimators when experimental data are subject to sampling errors. (*p. 337*)

138.6 *J. Palmgren (Finland)*
Precision of double sampling estimators for comparing two probabilities. (*p. 339*)

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16 Sept. (Wed.) 9:00 - 11:20 Room III (Seiun I)

Topic / Thème 125

Socio-economic studies (I).

Recherches socio-économiques (I).

Chairperson/Président: *K. Tsujimura (Japan)*

125.1 *K. Ichikawa (Japan)*
Marginal utility survey - quantification of dynamic phenomena - (*p. 187*)

125.2 *M.S. Kovačević (Yugoslavia)*
An integration of the surveys on consumption of households - Regression Linkage Model (RLM) - (*p. 241*)

125.3 *Z. Jiang, N. Lee (China)*
A production function with consumption factor. (*p. 207*)

125.4 *B. Kiregyera (Uganda)*
On methods for estimation of crop area and yield statistics in Africa. (*p. 233*)

125.5 *C. Quintano (Italy)*
Taillage urbain et territorial en deux expériences d'estimation directe des revenus municipaux en Italie. (*p. 359*)

125.6 *M. Taghvatalab (Iran)*
Housing rent in Iran. (*p. 431*)

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16 Sept. (Wed.) 9:00 - 10:40 Room H2 (Seiun II)

Topic / Thème 131

Sampling methods.

Méthodes d'échantillonnage.

Chairperson/Président: *T.E. Dalenius (Sweden)*

131.1 *S. Sai, M. Taguri (Japan)*
Optimum stratification based on concomitant variables and its application. (*p. 383*)

131.2 *N.A. Klevmarken (Sweden)*
On the estimation of recursive and interdependent models from sample survey data. (*p. 237*)

131.3 *J. Gong (China)*
The balanced systematic sampling method widely applied in China. (*p. 143*)

131.4 *J. Wurst, J. Neter, J. Godfrey (USA)*
Use of sieve sampling in auditing. (*p. 477*)

131.5 *H. Pettersson (Sweden)*
The national master sample in Tanzania; sample design and sampling errors. (*p. 345*)

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16 Sept. (Wed.) 14:30 - 17:30 Room F (Zuiun II and III)

Topic / Thème 4

Measurement and utilization of health related indicators.

Comment mesurer et utiliser les indicateurs de santé?

Organizer/Organisateur: *V.K. Verma (India)*
Chairperson/Président:

4.1 *A. Meegama (Sri Lanka)*
Measurement and utilization of health related indicators: historical and contemporary experience in Sri Lanka.

4.2 *C.P.B. Mkai (Tanzania)*
The community based health information system being established in Tanzania.

4.3 *M. Feinleib, P. Erickson (USA)*
Using large-scale national health and nutrition status surveys for evaluating population health levels: the NCHS experience.

Discussants/Discussiants: *K. Krickeberg (France)*
K. Uemura (Japan)

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16 Sept. (Wed.) 14:30 - 17:30 Room A (Ohtori - Higashi)

Topic / Thème 19

Recent developments of software systems for time series analysis.

Récents développements des systèmes de logiciels pour l'analyse des séries chronologiques.

Organizer/Organisateur: *G. Kitagawa (Japan)*
Chairperson/Président: *G. Kitagawa (Japan)*

19.1 *H. Akaike (Japan)*
On the development of TIMSAC program packages.

19.2 *M.A. Cameron, T.R. Turner (Australia)*
Time series analysis within interactive statistical packages.

19.3 *L.-M. Liu (USA)*
Integrated time series analysis and forecasting using the SCA statistical system.

Discussants/Discussiants: *R. Shibata (Japan)*
W.S. Cleveland (USA)

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16 Sept. (Wed.) 14:30 - 17:30 Room B (Ohtori - Naka)

Topic / Thème 31

Environmental risk assessment.

Estimation des crises de l'environnement.

Organizer/Organisateur: *D.G. Hoel (USA)*
Chairperson/Président: *T. Yanagawa (Japan)*

31.1 *I. Yoshimura (Japan)*
On the determination of the regulatory criteria for air pollution.

31.2 *D.A. Pierce, D.L. Preston (USA)*
Developments in cohort analysis with application to radiation induced cancer.

31.3 *F. Mosteller (USA)*
Compensating for radiation-related cancers by probability of causation or assigned shares.

Discussant/Discussiant: *B.H. Margolin (USA)*

16 Sept. (Wed.) 14:30 - 16:50 Room G (Yakumo)

Topic / Thème 109

Statistical methods for data with outliers.

Méthodes statistiques pour l'analyse de données avec points aberrants.

Organizer/Organisateur: *V. Barnett (UK)*
Chairperson/Président: *A. Takemura (Japan)*

109.1 *L. Denby (USA), C.L. Mallows (UK)*
Robust analysis of variance. (*p. 91*)

109.2 *M. Sibuya, J. Takeuchi (Japan)*
Outlier prone distributions. (*p. 407*)

109.3 *T. Tango (Japan)*
Estimation of normal range from clinical laboratory data with several outliers. (*p. 437*)

109.4 *F.F. Rosado (Portugal)*
Selecting outliers from the exponential family distributions. (*p. 375*)

109.5 *R.W. Butler (USA)*
Inference after trimming multivariate data with a Wilks' outlier statistic. (*p. 53*)

109.6 *Y. Dodge (Iran), J. Jureckova (Czechoslovakia)*
Adaptive combination of least squares and least absolute deviations estimators. (*p. 95*)

16 Sept. (Wed.) 14:30 - 17:30 Room I (Ryoun)

Topic / Thème 145

Statistical inference (II).

Inférence statistique (II).

Chairperson/Président: *D. Vere-Jones (UK)*

145.1 *S. Noorbaloochi (Iran)*
Finite admissibility of decision rules. (*p. 319*)

145.2 *S.A. Shaban (Kuwait)*
Evaluation of Lindley's approximate Bayesian methods. (*p. 401*)

145.3 *I.S. Song, J.C. Lee (Korea)*
A locally optimal rank test for the multiple change-points problem. (*p. 419*)

145.4 *A.H. Westlund (Sweden)*
On parameter constancy testing by a MOSUMSQ (OLS)-test. (*p. 469*)

145.5 *S. Johansen (Denmark)*
Identification and weak exogeneity. (*p. 209*)

145.6 *P.L. Gupta (USA), R.D. Gupta (Canada)*
Relative error in systems reliability. (*p. 149*)

145.7 *L.K. Chan, S.W. Cheng, F.A. Spiring (Canada)*
Some measures of process capability. (*p. 61*)

145.8 *A. Öztürk (Turkey)*
A study on the estimation of the mean and standard deviation of the normal distribution. (*p. 335*)

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16 Sept. (Wed.) 14:30 - 15:50 Room H1 (Seiun I)

Topic / Thème 126

Socio-economic studies (II).

Recherches socio-économiques (II).

Chairperson/Président: *S. Nordbotten (Norway)*

126.1 *A. Dornonville de la Cour (Denmark)*
Changed conditions for the production of economic statistics. (*p. 97*)

126.2 *E. Xekalaki (Greece)*
Some estimation aspects in connection with underreporting of accident or income data. (*p. 479*)

126.3 *Y. Sunada (Japan)*
A study of the evaluation of corporate performance by electric and electronics equipment corporation in Japan. (*p. 429*)

126.4 *Yu Zhijun, Yu Hongying (China)*
Evaluation of developing level of computer business in China (1981-1985). (*p. 495*)

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16 Sept. (Wed.) 14:30 - 15:50 Room H2 (Seiun II)

Topic / Thème 107

Stochastic differential equations. Theory and applications.

Les équations différentielles stochastiques. Théories et applications.

Organizer/Organisateur: *M.G. Metivier (France)*
Chairperson/Président: *M.G. Metivier (France)*

107.1 *A.N. Shiryayev (USSR)*
On non-linear filtering. (···)

107.2 *M. Sørensen (Denmark)*
On the motion of small particles in a turbulent wind field. (*p. 421*)

107.3 *M.J. Beckmann (FRG)*
The speculators dilemma. (*p. 43*)

107.4 *N. Ikeda (Japan)*
Some topics on asymptotics of diffusion processes. (*p. 195*)

6. 發表論文 主題

- 招請論文目錄
- 寄託論文目錄
- 主要論文拔萃

論文番號 題目

1.3 統計理論 및 方法論의 發展과 官廳 統計에서 利用 (스웨덴)
(The advance of statistical theory and methodology and their uses in official statistics)

6.3 品質管理에 대한 統計學者의 貢獻 (미국)
(On the statistician's contribution to quality)

11.1 標本센서스 : 標本調査로 全數調査를 代身할 수 있을까 (미국)
(A sample census : a valid alternative to a complete count census)

18.3 開發途上國의 統計活動을 위한 컴퓨터 活動 (한국)
(The use of computers for statistical activities in developing countries)

19.1 TIMSAC컴퓨터 팩키지 프로그램 開發에 대하여 (일본)
(On the development of TIMSAC program package)

20.1 濠洲統計局의 데이타 베이스에 관한 經驗 (호주)
(Experience with ADABAS at the Australian Bureau of Statistics)

104.1 人口센서스 評價 (영국)
(Census Evaluation : how good is the information that is collected)

Topics of Scientific Meetings
Thèmes des Réunions Scientifiques

Invited Papers/Communications Invitées

Topic/Thème 1 9 Sept. (Wed.) 9:00~12:00 Room A (Ohtori-Higashi)

The trend of official statistics. Some problems connected with the future.

L'évolution des statistiques officielles. Quelques questions relatives à leur avenir.

Topic/Thème 2 9 Sept. (Wed.) 14:30~17:30 Room A (Ohtori-Higashi)

Development of statistics in Japan. Past experiences and present problems.

Le développement de la statistique au Japon. Expérience passée et problèmes actuels.

Topic/Thème 3 12 Sept. (Sat.) 9:00~12:00 Room A (Ohtori-Higashi)

Analysis of historical records. Comparative historical demography.

Analyse des archives historiques. Démographie historique comparative.

Topic/Thème 4 16 Sept. (Wed.) 14:30~17:30 Room F (Zuiun II and III)

Measurement and utilization of health related indicators.

Comment mesurer et utiliser les indicateurs de santé?

Topic/Thème 5 10 Sept. (Thur.) 14:30~17:30 Room A (Ohtori-Higashi)

Statistical techniques for improvement of quality and productivity.

Techniques statistiques pour l'amélioration de la qualité et de la productivité.

Topic/Thème 6 11 Sept.(Fri.) 9:00~12:00 Room A+B (Ohtori-Higashi and Naka)

Papers by special invitation of the President.

Communications sur invitation spéciale du Président.

Topic/Thème 7 14 Sept. (Mon.) 14:30~17:30 Room F (Zuiun II and III)

Best papers by recent graduates from developing countries.

Sélection des meilleures communications de jeunes diplômés de pays en voie de développement.

Topic/Thème 8 12 Sept. (Sat.) 9:00~12:00 Room F (Zuiun II and III)

Measuring change from surveys.

Comment mesurer des évolutions à partir d'enquêtes?

Topic/Thème 9 11 Sept. (Fri.) 14:30~17:30 Room A (Ohtori-Higashi)

Master samples in national household surveys.

Echantillons-maîtres dans les enquêtes nationales auprès des ménages.

Topic/Thème 10 14 Sept. (Mon.) 9:00~12:00 Room F (Zuiun II and III)

Variance estimation with complex samples.

Estimation de la variance avec échantillons complexes.

Topic/Thème 11 14 Sept. (Mon.) 9:00~12:00 Room A (Ohtori-Higashi)

The future of the population census.

L'avenir des recensements de population.

Topic/Thème 12 14 Sept. (Mon.) 14:30~17:30 Room A (Ohtori-Higashi)

Methodological issues in surveys for price indices.

Problèmes méthodologiques des enquêtes destinées à l'établissement des indices de prix.

Topic/Thème 13 15 Sept. (Tues.) 9:00~12:00 Room A (Ohtori-Higashi)

Effects of mode of data collection on survey response.

L'influence des modes de collecte des données sur les réponses à une enquête.

Topic/Thème 14 16 Sept. (Wed.) 9:00~12:00 Room A (Ohtori-Higashi)

Statistical education in government and industry.

L'enseignement de la statistique dans l'administration et l'industrie.

Topic/Thème 15 14 Sept. (Mon.) 9:00~12:00 Room B (Ohtori-Naka)

Artificial intelligence and expert systems in statistics.

Intelligence artificielle et systèmes experts en statistiques.

Topic/Thème 16 15 Sept. (Tues.) 9:00~12:00 Room B (Ohtori-Naka)

Statistical graphics.

La représentation graphique en statistique.

Topic/Thème 17 11 Sept. (Fri.) 14:30~17:30 Room B (Ohtori-Naka)

Problems of and approaches to analysing large data sets.

Problèmes et moyens de l'analyse des grands ensembles de données.

Topic/Thème 18 12 Sept. (Sat.) 9:00~12:00 Room B (Ohtori-Naka)

Statistical needs of developing countries.

Les besoins des pays en voie de développement en ce qui concerne la statistique.

Topic/Thème19 16 Sept. (Wed.) 14:30~17:30 Room A (Ohtori-Higashi)

Recent developments of software systems for time series analysis.

Récents développements des systèmes de logiciels pour l'analyse des séries chronologiques.

Topic/Thème 20 10 Sept. (Thur.) 14:30~17:30 Room B (Ohtori-Naka)

Advances in data banks and network. Building and management.

Progrès dans la construction et la gestion des banques de données et des réseaux.

Topic/Thème 21 16 Sept. (Wed.) 9:00~12:00 Room B (Ohtori-Naka)

Statistical methods for spatial image analysis.

Méthodes statistiques pour l'analyse d'images spatiales.

Topic/Thème 22 11 Sept. (Fri.) 14:30~17:30 Room F (Zuiun II and III)

Recursive procedures for time sequenced data.

Procédures récursives pour les données échelonnées dans le temps.

Topic/Thème 23 9 Sept. (Wed.) 14:30~17:30 Room F (Zuiun II and III)

New developments in time series modelling and analysis.

Développements récents de la modélisation et de l'analyse des séries chronologiques.

Topic/Thème 24 10 Sept. (Thur.) 14:30~17:30 Room F (Zuiun II and III)

Estimation from accelerated tests and short term tests in reliability and medicine.

Estimation à partir de tests accélérés et à court terme en fiabilité et en médecine.

Topic/Thème 25 9 Sept. (Wed.) 9:00~12:00 Room F (Zuiun II and III)

Self-similar processes.

Processus auto-similaires.

Topic/Thème 26 9 Sept. (Wed.) 9:00~12:00 Room B (Ohtori-Naka)

Principles and strategies of data analysis.

Principes et stratégies de l'analyse des données.

Topic/Thème 27 9 Sept. (Wed.) 14:30~17:30 Room B (Ohtori-Naka)

Survey processing on microcomputers.

Traitement des enquêtes sur micro-ordinateurs.

Topic/Thème 28 14 Sept. (Mon.) 14:30~17:30 Room B (Ohtori-Naka)

Statistical computing in the 90's. Impact of the fifth generation.

Le calcul statistique dans les années 90. Impact de la cinquième génération d'ordinateurs.

Topic/Thème 29 15 Sept. (Tues.) 9:00~12:00 Room F (Zuiun II and III)

Small area statistics.

Les statistiques relatives à de petites zones géographiques.

Topic/Thème 30 16 Sept. (Wed.) 9:00~12:00 Room F (Zuiun II and III)

New developments in the statistical methodology in chemistry.

Développements récents de la méthodologie statistique en chimie.

Topic/Thème 31 16 Sept. (Wed.) 14:30~17:30 Room B (Ohtori-Naka)

Environmental risk assessment.

Estimation des crises de l'environnement.

Contributed Papers/Communications Libres

Topic/Thème 101 12 Sept. (Sat.) 9:00~10:40 Room G (Yakumo)

Current issues in principles of statistical inference.

Problèmes actuels relatifs aux principes de l'inférence statistique.

Topic/Thème 102 14 Sept. (Mon.) 9:00~10:20 Room H1 (Seiun I)

Statistical methodology for studying the status of women (I).

Méthodologie statistique pour l'étude de la condition féminine (I).

Topic/Thème 103 12 Sept. (Sat.) 10:00~10:40 Room H1 (Seiun I)

Statistical methodology for studying the status of women (II).

Méthodologie statistique pour l'étude de la condition féminine (II).

Topic/Thème 104 14 Sept. (Mon.) 14:30~17:30 Room G (Yakumo)

Census evaluation (I).

Evaluation des recensements (I).

Topic/Thème 105 15 Sept. (Tues.) 9:00~10:20 Room I (Ryoun)

Census evaluation (II).

Evaluation des recensements (II).

Topic/Thème 106 11 Sept. (Fri.) 14:30~16:10 Room G (Yakumo)

Handling missing data in surveys.

Comment prendre en compte les données manquantes dans les enquêtes.

Topic/Thème 107 16 Sept. (Wed.) 14:30~15:50 Room H2 (Seiun II)

Stochastic differential equations. Theory and applications.

Les équations différentielles stochastiques. Théories et applications.

Topic/Thème 108 15 Sept. (Tues.) 9:00~10:40 Room G (Yakumo)

Repeated measurement and crossover design.

Mesures répétées et plans d'expérience en "cross-over".

Topic/Thème 109 16 Sept. (Wed.) 14:30~16:50 Room G (Yakumo)

Statistical methods for data with outliers.

Méthodes statistiques pour l'analyse de données avec points aberrants.

Topic/Thème 110 10 Sept. (Thur.) 14:30~17:30 Room I (Ryoun)

Timeliness and accuracy in preliminary estimates and revisions of economic data.

Précocité et précision des premières estimations et révision des informations économiques.

Topic/Thème 111 14 Sept. (Mon.) 9:00~10:20 Room G (Yakumo)

Analysis of circular data.

Analyse des données circulaires.

Topic/Thème 112 9 Sept. (Wed.) 9:00~11:20 Room H1 (Seiun I)

Stochastic models in biomedicine.

Modèles stochastiques en biomédecine.

Topic/Thème 113 9 Sept. (Wed.) 14:30~15:50 Room H2 (Seiun II)

Early stopping in medical studies.

Arrêt prématuré des études médicales.

Topic/Thème 114 9 Sept. (Wed.) 9:00~10:20 Room G (Yakumo)

Survey-sampling.

Enquête-échantillonnage.

Topic/Thème 115 9 Sept. (Wed.) 14:30~16:10 Room G (Yakumo)
Problems in designing case-control studies.
Problèmes en plan d'une étude par cas-contrôle.

Topic/Thème 116 11 Sept. (Fri.) 14:30~16:10 Room I (Ryoun)
Confidentiality protection in national statistical offices.
Protection confidentielle des bureaux nationaux de statistiques.

Topic/Thème 117 10 Sept. (Thur.) 14:30~17:30 Room H2 (Seiun II)
Asymptotic expansions and approximations of statistics (I).
Expansions asymptotiques et approximations des statistiques (I).

Topic/Thème 118 14 Sept.(Mon.) 14:30~16:50 Room I (Ryoun)
Asymptotic expansions and approximations of statistics (II).
Expansions asymptotiques et approximations des statistiques (II).

Topic/Thème 119 9 Sept. (Wed.) 15:50~17:10 Room I (Ryôun)
Medical statistics (I).
Statistique médicale (I).

Topic/Thème 120 14 Sept. (Mon.) 14:30~16:50 Room H1 (Seiun I)
Medical statistics (II).
Statistique médicale (II).

Topic/Thème 121 15 Sept. (Tues.) 9:00~10:40 Room H1 (Seiun I)
Hazard analysis.
Analyse du hasard.

Topic/Thème 122 9 Sept. (Wed.) 14:30~16:10 Room H1 (Seiun I)
Demography.
Démographie.

Topic/Thème 123 12 Sept. (Sat.) 9:00~10:40 Room I (Ryoun)
Statistical computing.
Calcul statistique.

Topic/Thème 124 10 Sept. (Thur.) 16:00~17:40 Room G (Yakumo)
Price indices.
Indices de prix.

Topic/Thème 125 16 Sept. (Wed.) 9:00~11:20 Room H1 (Seiun I)
Socio-economic studies (I).
Recherches socio-économiques (I).

Topic/Thème 126 16 Sept. (Wed.) 14:30~15:50 Room H1 (Seiun I)
Socio-economic studies (II).
Recherches socio-économiques (II).

Topic/Thème 127 11 Sept. (Fri.) 16:10~17:10 Room H1 (Seiun I)
Time series (I).
Série chronologique (I).

Topic/Thème 128 14 Sept. (Mon.) 14:30~17:10 Room H2 (Seiun II)
Time series (II).
Série chronologique (II).

Topic/Thème 129 10 Sept. (Thur.) 14:30~15:50 Room G (Yakumo)
Official statistics and surveys (I).
Statistiques officielles et enquêtes (I).

Topic/Thème 130 11 Sept. (Fri.) 16:30~17:30 Room G (Yakumo)
Official statistics and surveys (II).
Statistiques officielles et enquêtes (II).

Topic/Thème 131 16 Sept. (Wed.) 9:00~10:40 Room H2 (Seiun II)
Sampling methods.
Méthodes d'échantillonnage.

Topic/Thème 132 11 Sept. (Fri.) 14:30~15:50 Room H2 (Seiun II)
Testing hypothesis (I).
Test d'hypothèse (I).

Topic/Thème 133 16 Sept. (Wed.) 9:00~10:00 Room G (Yakumo)
Testing hypothesis (II).
Test d'hypothèse (II).

Topic/Thème 134 9 Sept. (Wed.) 9:00~11:20 Room I (Ryoun)
Multivariate analysis (I).
Analyse multivariante (I).

Topic/Thème 135 9 Sept. (Wed.) 14:30~15:30 Room I (Ryoun)
Multivariate analysis (II).
Analyse multivariante (II).

Topic/Thème 136 11 Sept. (Fri.) 16:10~17:30 Room H2 (Seiun II)
Stochastic process (I).
Procédé stochastique (I).

Topic/Thème 137 12 Sept. (Sat.) 11:00~12:00 Room G (Yakumo)
Stochastic process (II).
Procédé stochastique (II).

Topic/Thème 138 16 Sept. (Wed.) 9:00~11:20 Room I (Ryoun)
Estimation.
Estimation.

Topic/Thème 139 14 Sept. (Mon.) 9:00~11:40 Room H2 (Seiun II)
Design of experiments.
Plan des expérimentations.

Topic/Thème 140 9 Sept. (Wed.) 9:00~11:40 Room H2 (Seiun II)
Distribution (I).
Distribution (I).

Topic/Thème 141 9 Sept. (Wed.) 16:10~17:30 Room H2 (Seiun II)
Distribution (II).
Distribution (II).

Topic/Thème 142 16 Sept. (Wed.) 10:20~11:20 Room G (Yakumo)
Distribution (III).
Distribution (III).

Topic/Thème 143 12 Sept. (Sat.) 9:00~11:40 Room H2 (Seiun II)
Nonparametrics.
Non-paramétrique.

Topic/Thème 144 12 Sept. (Sat.) 9:00~9:40 Room H1 (Seiun I)
Statistical inference (I).
Inférence statistique (I).

Topic/Thème 145 16 Sept. (Wed.) 14:30~17:30 Room I (Ryoun)

Statistical inference (II).
Inférence statistique (II).

Topic/Thème 146 15 Sept. (Tues.) 9:00~11:40 Room H2 (Seiun II)

Miscellaneous.
Miscellanées.

Poster meeting / Réunion d'affichage 1
9 Sept. (Wed.) 9:00~12:00 Room C (Ohtori-Nishi)

Statistical inference.
Inférence statistique.

Poster meeting / Réunion d'affichage 2
9 Sept. (Wed.) 14:30~17:30 Room C (Ohtori-Nishi)

Socio-economic studies.
Recherches socio-économiques.

Poster meeting / Réunion d'affichage 3
14 Sept. (Mon.) 9:00~12:00 Room C (Ohtori-Nishi)

Multivariate analysis.
Analyse multivariante.

Poster meeting / Réunion d'affichage 4
14 Sept. (Mon.) 14:30~17:30 Room C (Ohtori-Nishi)

Indices and others.
Indices et les autres.

Invited Paper 1.3
46th Session of the ISI

THE ADVANCE OF STATISTICAL THEORY AND METHODOLOGY AND THEIR USES IN OFFICIAL STATISTICS

L. Lyberg
E. Rapaport
Statistics Sweden

I. Introduction

1. Aims and scope

The area represented by the title of this paper is so broad that it demands definition and interpretation before we can begin discussing the issues it raises. We could put the emphasis on advances that have taken place in official statistics. But it is impossible to keep track of the multitude of advances that have taken place in the development of statistical methodology and theory. We could select a few areas deemed important to official statistics. Or we could emphasize the theoretical contributions and discuss the various statistical theories developed by Bayes, Fisher, or Neyman-Pearson. Another approach would be to discuss theory vs methodology or whether official statistics should be based on inference or decision theory. We could also concentrate on either model building, the role of sampling or some other important issues in official statistics. With enough skill and luck, we might even end up with a pretty sophisticated paper.

Despite the lure of the theoretical approaches named above, we have chosen a pragmatic one. Our choice is justified by the practical concerns that dominate a statistician's work day. The demands on and needs for official statistics are increasing. This is reflected in mass media discussions about the information society. At the same time, funds for producing these statistics are decreasing. This holds true for most countries. The need for more refined statistical products is more obvious today than 15 years ago. Among these refinements are in-depth analyses that use multivariate methods. This kind of analysis requires a close cooperation between subject-matter specialists and mathematical statisticians. Data quality, defined in a wide sense, is often unsatisfactory. The research on nonsampling errors during the last 20 years has not been as extensive or as intensive as we had expected it to be. Nor have those ideas that have been put forth been applied to their full potential.

In many countries, public opinion has been unfavorable towards the collection and registration of data on individuals and households. Many statistical agencies face a distrusting public that in turn leads to increased nonresponse that further errodes data quality. This unhappy combination of events and circumstances puts tremendous pressure on these agencies and their staff. Many agencies do not have enough mathematical statisticians to deal with daily problems, conduct in-house research, and to take advantage of research conducted elsewhere. Problems tend to go unsolved or are solved the same way every time they occur. These problems create a milieu in which it will be very difficult to produce official statistics during the forthcoming decade unless great changes occur.

The aim of this paper is to structure the issues, provide some examples of areas that need development, discuss factors that are beneficial or detrimental to future official statistics and provide suggestions for research.

2. A General Background

2.1 What is meant by official statistics?

Current dictionaries and lexicons do not, to our knowledge, provide definitions of official statistics. Many implicit definitions do exist; all of them relate official statistics to national statistical programs conducted by national offices. From this, we might conclude that official statistics are derived from the system of national accounts and surveys and censuses designed to collect socio-economic data. The type of data collected for official statistics varies among different countries as does the organization of the statistics production. For instance, some countries collect data on voting behavior, environment, and broadcasting, whereas in other countries these are not considered official statistics. The degree of centralization of statistical agencies also varies among countries. In the United States, the production, analysis, and dissemination of official statistics are decentralized among a number of agencies while in countries like Canada and Sweden these activities are highly centralized.

2.2 The advance of statistical theory and methodology

An exhaustive historical account of the development of official statistics lies outside the scope of this paper. Yet we do attempt to highlight the major developments, however sweeping and impressionistic our account may seem to be. What follows can be considered a 100-yard dash through the history of statistics, with many important persons and significant contributions omitted. Those who are interested in a more complete and detailed account are referred to Kendall and Plackett (1977) and Owen (1976).

Combinatorial problems were dealt with as early as the 10th century. In 1540 Cardans defines probability as the ratio of the number of successful outcomes divided by the number of possible outcomes. In the 17th century, Galilei, Fermat, Pascal, and Huygens worked with probability theory. Bernoulli's Ars Conjectandi might be considered the apex of this era. During the next 150 years, scientists like de Moivre, Laplace, Gauss and Poisson propel mathematics, probability, and statistics forward. Limit theorems and distribution functions are among the great contributions of this era. The Russian school gains prominence around 1850 with the stellar combination of Tjebysjev, Markov, Liapunov, and Kolmogrov and their work on stochastic variables. Work on stochastic variables was also done in France by Levy and Frechet.

By the beginning of the 20th century, new disciplines emerged and we could now talk of mathematical statistics. In 1897 Fechner coins the term for descriptive statistics, "Kollektivmasslehre." To describe empirical distributions, Karl Pearson and others developed systems for frequency curves. Laplace and Gauss were the first to formulate problems about point estimation. Gauss and Laplace's ideas were further developed by Markov, Karl Pearson, Fisher, among others. Fisher introduced the concepts of consistency, efficiency, and sufficiency.

Hypothesis testing was introduced in the 1930s by Neyman and Egon Pearson. Neyman also introduced the concept of confidence intervals. The first important step to quantify experimental results was taken by Student (Gosset) in 1908 when deriving the t-distribution. However, it was Fisher who first developed the theory of experimental design. Fisher collaborated with Yates on experimental design applications that lead to the further refinement of Fisher's concept of randomization.

Although survey sampling is a tool that had been used intuitively for centuries, no specific theory for sampling was developed until 1900. When we say sampling theory, we mean theoretical work that links probability theory and statistical theory to the practices of survey sampling. Hansen et al. (1985) and Rossi et al. (1983) discuss different aspects of the evolution of survey sampling. Kiear (1897), Bowley (1913), (1926), and Tschuprow (1923) were among those who early on devoted their energies to promoting the development and use of sampling techniques. They discussed concepts like stratified sampling, multistage sampling from finite populations, optimum allocation of a sample to strata, and the representative method.

In 1934 Neyman presented his classic paper "On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection." In this paper, Neyman stressed the importance of having a random sample. He also dealt with optimum stratification (already independently dealt with by Tschuprow), cluster sampling, the approximate normality of linear estimators for large samples, and a model for purposive selection. Like other major breakthroughs, it took a while for Neyman's ideas to gain prominence.

This is also true for the work Fisher conducted on experimental design at Rothamsted. Fisher's work was of great importance for survey sampling but was not widely applied until 1935 when Yates and Zacopaney did an extensive analysis of sampling and subsampling in agriculture. Since the 1940s, the development of sample surveys has indeed been rapid. We can cite contributions from Cochran, Mahalanobis, Hansen, Deming, Dalenius, Kish, Keyfitz, and Hartley to mention just a few. Around 1950 the basics of the sampling models used today were developed.

Official statistics draws heavily on all these contributions in probability and mathematical statistics.

2.3 The links between statistical theory, methodology and official statistics

Modern official statistics are produced using an extensive battery of tools and skills. First, many disciplines come into play in the production of statistics, for example, statistical theory, computer science, social science, agriculture, economics, etc. A few examples of the subdisciplines of census and survey methodology that are used in the production of official statistics are: sampling theory, nonsampling errors, questionnaire development, use of administrative records, data processing, data quality, analysis, and presentation. Examples of other general methodological fields important to official statistics include econometrics, statistical quality control, experimental design, standards and classification, demography, and methods of assessing the benefits of statistical information. The producers of official statistics should use sound methods from all of these disciplines. For this reason, government statisticians should be conversant with a wider range of methodology than other statisticians.

Official statistics have been around for centuries, and problems with, for example, measurement errors were recognized early (e.g., see Wargentin (1780)). No obvious links with early probability theory and statistical theory were made, though. That process did not start until around 1900 with the efforts mentioned above. The development has been rapid since 1940 not only including survey methodology but also in other fields relevant to official statistics. Theoretical and methodological advances have been made at universities, research organizations, and within national officies. However, it seems that most development work has been done outside of the national offices. One exception is the U.S. Bureau of the Census where a great deal of basic research and breakthroughs in applications were made quite early. Sampling was used in the 1940 U.S. Census. In 1943, the U.S. Current Population Survey (CPS) was conducted using sampling only. The CPS has since served as a model for labor force surveys all over the world. During recent decades, other national offices, like Statistics Canada, have accomplished outstanding theoretical and methodological results.

Today most national offices have research units, but by and large, official statistics could not do without the advances made outside the walls of the national officies. Of course, official statistics have developed differently in different countries depending on that country's access to registers, attitudes towards research in national offices, supply of mathematical statisticans, and that country's specific problems.

II. Data Collection

3. Various modes

Official statistics employs many different modes of data collection, each having its advantages and disadvantages. Mail surveys are relatively inexpensive, but usually demand numerous reminders to counter high nonresponse rates. Sometimes the nonresponse rates are so high that mail surveys must be combined with other collection modes like telephone or personal (face-to-face) interviews. Mail survey questionnaires are by necessity limited in scope and must be as comprehensible as possible to as many respondents as possible.

Personal interviews have many advantages when compared to other collection modes. Personal interviews usually provide higher quality responses than, for example, mail surveys. However, they might not perform as well as other collection modes when sensitive questions are asked. There is also the high cost of training and monitoring interviewers to avoid correlated interviewer errors. To the already high costs of conducting personal interviews, one must add the expense of travel and saleries. In industrialized countries, only large and prominent survey organizations can keep a corps of interviewers. The opposite extreme is seen in developing countries where interviewers or enumerators are essential for any data collection at all.

Telephone interviews are an option for industrialized countries. The major disadvantage of telephone interviews is that there will always be people who cannot be reached by telephone, either because they do not have a phone or because they have an unlisted number. And, of course, the obvious advantage of telephone interviewing is that it is relatively inexpensive, especially when compared to personal interviews.

A mode of data collection that is intuitively appealing and highly economical is using administrative registers for statistical purposes. Using already existing material, although produced for other purposes, means decreased costs and decreased respondent burden. And we do use these registers. At Statistics Sweden we estimate that as much as 80-85% of the incoming data comes from administrative records. This estimate is based on a rough count of the "variable value" occurrences in the incoming files and questionnaires. It is perhaps true that the data from administrative files may not be as extensively used in statistics production as the data obtained from a regular collection (questionnaires etc). Yet the estimate can serve as an indication of the importance of administrative records. Using administrative records is by no means problem-free, though. Conceptual, technical and legal problems are involved. Quality problems exist since it is difficult for the statistical agency to influence the procedures that are used by the administrative systems developers.

Examples of other data collection modes that are not immediately associated with the production of official statistics but still have made significant contributions are diary keeping and direct observation. Diaries are used in consumer expenditure surveys and observation methods are used extensively in agricultural surveys. Scientific reviews of basic data collection methods are many and varied. Some examples are Erdos and Morgan (1970), Dillman (1978), Groves and Kahn (1979), and Hochstim (1967).

4. Research needed in data collection

The problems with data collection are manifold. It is difficult to develop an instrument that can collect accurate and relevant data. The instrument's length, question wording, and question order affect the data quality. For the most part, the vast literature on questionnaire design was developed outside the national offices. In fact, most of this research has been conducted by behavior scientists and not statisticians. Excellent overviews are provided in Presser and Schumann (1981) and Converse and Presser (1986). Government agencies have just recently taken a more active part in this research, as seen in the joint projects between national offices and research organizations. These efforts are often devoted to cognitive aspects of survey methodology and are usually interdisciplinary. The literature is vast and there is no recognized canon, but a few good examples are Platek et al. (1986), De Maio (1983), and Jabine et al. (1984). Experiments and studies in this field are often inconclusive, or even contradictory; sometimes they are even unreliable and not completely statistically sound. Survey statisticians and national offices should take a greater interest in these issues and contribute to the current research that is often conducted by nonstatisticians. Statisticians could aid this research by translating problem formulations into a statistical framework and lending methods from other areas of statistics, for example, measurable experimental designs without confounding, and the implementation of replication methods.

It is also important to keep in mind that very few surveys or statistical systems can function with just one data collection mode. Cost considerations, frame problems, nonresponse, and other errors make it necessary to combine different modes. Common combinations include personal and telephone interviews, mail surveys and telephone interviewing, administrative records and sample surveys, and censuses and sample surveys. A problem often seen in practice is that designers decide upon a main data collection mode and design their studies accordingly, but end up using another mode as well.

To avoid the trouble caused by ad hoc solutions, it is best to design the survey with a combined or mixed-mode collection strategy. The research in this area is fairly recent. Hartley (1974) discusses the theory behind multiple frame surveys, and Groves and Lepkowski (1985) give an account of mixed-mode designs. This kind of research should be further explored since errors and costs have become increasingly important for producers of official statistics.

The use of administrative records for statistical purposes has a long history. Early censuses had administrative purposes and the idea of censuses to produce statistics is relatively recent. Our ability to mine statistical data from administrative records has been brought about by and keeps pace with the great advances made in computer science. There has also been progress in the systems used to keep the administrative records themselves. These systems may not always cover the entire population of interest, but usually a good part of it. Linkage of records from different systems has become easier because of the use of identifiers. The development of sampling techniques and automated systems for processing large files are other examples of advances that increase the potential uses of administrative files. The potential to produce statistics offered by administrative registers has not been fully realized because those who set up and maintain these registers are usually not statisticians. This often results in inadequate coverage, incongruence with statistical needs, and questionable accuracy. There is a trade-off here; reductions in costs and respondent burden must be weighed against the problems presented by files set up for administrative purposes. This trade-off is a central theme for research on the use of administrative registers for statistical purposes. For a further discussion of this, see Internal Revenue Service (1984).

The same pressures that have spurred research on the statistical uses of administrative registers has pushed research into new fields. One such field is random digit dialing (RDD). In RDD the sampling frame consists of telephone numbers rather than individuals or businesses. Waksberg (1978) covers the basics and a bit more. Another field that has recently gained prominence is computerized data collection, CADAC. Among the different CADAC techniques that have been tried, computer-assisted telephone interviewing, CATI, has had the most success. Hand-held devices have reached to prototype stage at Statistics Sweden and the results look promising. CADAC replaces or at least complements collection conducted with paper and pencil. Though the technology per se is new, the methodology it employs is not completely new. Those active in developing this new technology maintain that it reduces both error and cost, but without more evaluation studies we do not have adequate evidence to confirm or discard this assumption. Nicholls and Groves (1986) and Groves and Nicholls (1986) present in their two part paper an exhaustive account of the state of the art.

An exciting and new tool for data collection is remote sensing. Data on crop yield, natural resources, and land use are collected by means of aerial photographs and satellites. The U.S. Department of Agriculture uses Landsat data to improve estimates of the area devoted to the cultivation of different crops. In this case the remotely sensed data are used as auxiliary information. But such data can also be used to construct area sampling frames. Experiments with use-of-land statistics are currently conducted in several industrialized countries. Remote sensing has also proved valuable in developing countries where there is a lack of reliable maps. Some references that discuss this technology are Justusson (1984) and Vogel (1985).

III. Data Processing

The collected data undergo a number of operations before the results can be published. Operations that transform or prepare the data for processing, such as data capture and coding, often deteriorate the data quality. Editing is something of a mixed blessing because it functions as a control of the data collection but in some cases it too can lead to worsened quality.

There are three kinds of problems associated with data processing operations; processing operations are error prone, time consuming and costly. For these reasons, there has been much research devoted to developing quality control and automation techniques. Manual operations in data processing resemble the assembly line in a factory. Statistical quality control originally developed for industrial conditions have found applications in the production of official statistics. Many industrial sampling schemes are transferable and are often called administrative applications. The automation of operations is one area where national offices have done most of the research and reaped the benefits of reduced costs and errors.

5. Editing and imputation

Editing ensures that the collected data meet the quality standards of completeness and internal consistency. The producer specifies the limits or the degree to which the data is allowed to be changed by editing and imputation. Early editing techniques were designed so that the anomalies and missing values should not disturb the subsequent processing. Early policies (see Ogus et al. (1967)) stated that only a few percent of the data should be adjusted to guarantee that the adjustments did not have adverse or uncontrolled effects on the results. Recently, imputation methodology has attracted researchers working outside national offices. The results have been rather elaborate imputation procedures. Some of these procedures depart from the spirit of the original reason for using fabricated data and see imputation as a means to reduce the effects of nonresponse. Survey practitioners should carefully analyze the weight given to editing compared to other operations. Surveys that perform extensive editing and imputation should consider the benefit of allocating more resources to pilot surveys, questionnaire design, interviewer training, etc and thus lessening the need for extensive editing. Not everything that can be checked should be checked. As stated by the United Nations (1982) "To make extensive changes in the collected data prior to making them available for analysis is to violate a basic principle in data collection that the integrity of the data should be respected." It is also essential for producers of statistics to distinguish between the two uses of imputation methodology, imputation as a complement to editing, and imputation as a means of handling nonresponse. Some references dealing with the latter use are Herzog and Rubin (1983) and Platek and Gray (1983).

6. Data capture

In surveys, the data capture operations consist of converting the data to a machine readable format. This is usually done by either manual keying or an automated process like optical character recognition. Typically, data capture generates low error rates. Still the effect that this operation has on data quality has been the subject of much investigation. In some cases, the interest and resources devoted to this source of error are unjustified by the magnitude of the error generated. Extensive acceptance sampling and process control has been used to control this error source while other more

error prone operations remain less attended to. This is the result of what we might call the "device approach." When an operation is easily monitored and controlled by already existing techniques, it receives attention disproportionate to its actual importance. Of course, there should be quality control of data capture, but not more than is motivated by the error rate per se and by the error rate compared to those of other operations.

7. Coding

Coding is an important operation in the production of official statistics because the data collected in, say, population censuses, business censuses, and labor force surveys must be coded before processing, tabulation, or analysis can begin. The idea behind coding is simple, although its actual execution is complex. Coding entails assigning elements in a set (responses in a survey) to the appropriate categories (the codes) and can be performed manually by coders or automatically by machines.

Manual coding is time consuming, costly, difficult to control, and can generate error rates of about 10%. Verification is a common method of controlling coding errors, and two main schemes exist, dependent and independent verification. In independent verification, the verifier does not have access to the code assigned by the production coder. The outgoing code is the result of a comparison between the original code assigned by the production coder and the codes assigned by a number of verifiers. This method is based on simple probability theory and is much more reliable than dependent verification where the verifier checks the original code and decides whether or not it is correct. See Lyberg (1981) for a review of manual coding and its problems.

Large scale coding operations lend themselves to statistical quality control, for example, acceptance sampling and process control or mixtures of the two. This research (see e.g., Minton (1972)) is a direct application of the early work conducted by Dodge and Romig (1944).

A method that reduces the need for the control methods discussed above is automated coding. The dictionary used in manual coding is stored in a computer. Element descriptions are entered into the computer and matched against the dictionary. Not all descriptions can be coded by the computer, but the Swedish experiments and applications typically result in coding degrees of about 70%. Research on automated coding include the development of coding algorithms, some of them using sophisticated methods emanating from artificial intelligence. In Lyberg(1981) and Knaus (1987) automated coding is extensively dealt with.

IV Some Present and Future Topics of Special Interest

8. The use of administrative registers and record linkage

As already discussed, rising costs and diminishing appropriations have forced many agencies to consider new collection procedures. Access to registers initially set up for administrative purposes is promising, but at the same time the use of registers is problematic. The costs for using registers are indeed competitive but the quality problems are far from solved. The picture gets even more complicated if registers are linked. There might be problems with definitions, timeliness and that different registers contain

data that are of different ages. To further complicate the situation, there is no good way of controlling the data collection. Record linkage has applications outside of administrative records research. Linking can be used to develop sampling frames. Basic theories of record linkage are discussed in Tepping (1968) and Fellegi and Sunter (1969). As pointed out by Jabine and Scheuren (1986) record linkage in the 1970s continued to be heuristic despite the early theoretical advances. Lack of interest among statisticians and lack of general purpose matching software contributed to the standstill in record linkage research. Jabine and Scheuren name important areas that need more work.

9. Nonsampling errors

There is a well-developed theory of sampling models and their associated errors. As sampling theory has developed, so has an awareness of the problems presented by nonsampling errors. Early work on nonsampling errors dealt almost exclusively with specific sources of nonsampling errors, like nonresponse. During the 1950s a comprehensive theory of an integrated treatment of nonsampling errors evolved. This work dealt with survey models or mixed error models. Today research is conducted in each of these areas.

Specific error sources can be dealt with by an entire arsenal of preventive controls. Pilots and other pretests reveal weaknesses in the training of interviewers, the clarity of questions, and questionnaire design. Quality control measures often entail continually checking the data processing to see that quality standards are met. After the data are processed, they are weighted and adjusted and the adjustment is usually based on a model or on auxiliary information. In evaluation studies, the final survey results are checked on a sample basis against information that is considered superior, but for various reasons not used in the survey proper. There are thousands of documented studies dealing with specific sources of nonsampling error. Most of these studies deal with nonresponse which is the most unscrutable of errors. Most errors can, at least theoretically, be dealt with if the surveyor has adequate financial and administrative resources. But with nonresponse, there are no definite solutions for the missing data. In Hansen and Hurwitz (1946), a theoretically unbiased solution is provided by subsampling among initial nonrespondents. Like all other methods meant to deal with nonresponse, it relies, however, heavily on specific assumptions, in this case that responses can actually be obtained from the subsampled nonrespondents. Nonresponse has become increasingly troublesome for official statistics. Many national offices have had to face, on a large scale, respondents who are reluctant and resist survey participation. Censuses have been the topic of heated debates and in some instances, they have even had to be cancelled. Research on nonresponse has focussed on various weighting and adjustment procedures, but it is hard to see how these efforts can ultimately solve the basic problem of missing data. It is probably more efficient to allocate resources to preventive measures, to motivate respondents, and to try to measure the effects of nonresponse. An excellent review of the issues and problems generated by nonresponse is found in Madow et al. (1983).

In the further development of survey models lies a great potential to find solutions for the problems presented by nonsampling errors. This research is directed towards an integrated control of all sources of error and thus a control of the total error. Survey models have three fields of application, namely: estimation of the total error, estimation of the relative impact of different error sources on the total error, and estimation of

the components of specific sources of error. The most renown survey model developed so far is by Hansen et al.(1964). This model decomposes the total error into the sampling variance, the response variance, the covariance of the response and sampling deviations, and the squared bias. The error components can be measured by interpenetration and repeated measurements. There are also other types of survey models based on, for instance, ANOVA and misclassification probabilities.

Survey quality work has been affected by the use of survey models. Survey models provide a framework that has permeated survey practice and models have been used to measure error components, either using imbedded experiments or evaluation studies. Despite successful applications of survey models in the USA, Canada, and India, their use is not a widespread survey practice. There are several reasons for this. Not all sources of error are covered by the models; model assumptions are not always met; and the cost of obtaining the error component estimates are often very high. Recent research has tried to address these drawbacks. For examples see Koch (1973), Hartley and Rao (1978), and Biemer (1986). In Forsman (1987) an overview of survey model research is provided.

Research on nonsampling errors receives more resources today than just a few decades ago. But the inprovement is not sufficient. Future survey research will need to draw from other disciplines, for instance from psychology. Theories of cognitive processes find practical application in research on the cognitive aspects of measurement errors (e.g., latent trait theory). More research needs to be conducted on model validation, the basic causes of nonsampling errors, and developing models that include both errors and costs.

10. Data analysis

Official statistics have traditionally been presented in tables. Refined presentations based on sophisticated data analysis have not been a major part of the work at national offices. The dominating opinion has been that a statistical agency should be impartial. Analysis can contain an element of subjectivity and should be left to the user and the subject matter specialist. Today the users themselves put new demands on statistical agencies. Users want more in-depth analysis, more detailed explanations, and more sophisticated graphs, diagrams, and maps. And it does seem natural that agencies provide more refined results. The producer knows the exact data collection method and any limitations inherent in the data. In addition, the data and the results must be presented in a way that allows the users to conduct their own analysis.

The analysis of official statistics employs many branches of statistics. Most national offices have devoted extensive resources to forecasting and demographics. Many people would like to see national offices produce more multivariate analyses such as regression, multivariate ANOVA, and factor analysis. Although there are many extensive and powerful statistical packages on the market, these are not adapted for the analysis of survey data. These packages work very well for data collected by simple sampling methods, but the more complex the sampling design, the more skewed the results can be. Most official statistics are gathered using more complex designs and the analysis must be adjusted accordingly. Smith (1981), Kalton (1983), Sundberg (1983), and Särndal (1985) provide in-depth discussions of

the analysis of survey data. A question that enters every discussion of analysis is data quality. It is the producer's role to inform the user about the types of analysis that the data can or cannot bear. Errors, varying definitions and concepts, record linkage, and missing values affect the data suitability for different kinds of analysis. Agencies should provide users with guidelines, but unfortunately, the agencies themselves are seldom completely sure exactly what these guidelines should be.

11. Miscellanea

The number of important areas that remain to be discussed is inversely proportional to the amount of space left for their discussion. Nevertheless, we can try to mention a few of these issues. Theory on sampling models has indeed come a long way and it seems logical to increase resources for dealing with nonsampling errors. On the other hand, a new interest in developing sampling and estimation techniques has emerged. New types of surveys, for instance, longitudinal surveys and surveys producing small area statistics require new tools, tools like modelling and extensive use of auxiliary information. The role of models in the design and analysis of surveys is discussed in Hansen et al. (1983), Kalton (1983), and Särndal (1985) to mention a few. New or relatively new concepts and techniques like synthetic estimation, the predictive approach, design-based estimation, model-based estimation, SPREE, and statistical matching are frequently discussed and applied. Many statisticians have qualms about using models in survey design, and use these models only as a last resort, as in the case of estimation for small areas. For small area statistics, this is truly the only solution since the small sample sizes do not permit a design-based approach. See Purcell and Kish (1979) for a discussion of model-based estimation for small areas.

The work on quality control should be distinguished from general work on survey errors. When we talk about quality control or quality assurance we refer to cases where we know something about the errors. Either we work on finding the error source that might disturb the survey results and adjust the instrument accordingly or we conduct an evaluation study (a more refined and costly survey that measure the quality of the regular survey). The quality control could also be conducted during the production by using administrative applications of the sampling schemes developed for industrial purposes. We are then able to guarantee the outgoing quality in some specific operation, like data capture or coding. Quality control is hampered by the abscence of quality specifications from data users. In industrial applications, the manufacturer is controlled by the buyer. If the quality is substandard, the manufacturer is held responsible. In the production of official statistics, there is almost never this kind of interaction. Official statistics has a magic of its own and the consequences of bad data are often neglected.

There is certainly a need for a well defined, theoretically supported, and generally accepted framework for this kind of quality control, i.e., preventive control, quality assurance, and measurement of the quality actually achieved. It seems imperative that statistical agencies accept the responsibilities of educating users in these matters.

Statistical agencies around the world share a specific problem, namely the protection of privacy and confidentiality. Of course, these problems have always existed, but in many ways they have culminated over the past 20 years and now demand special financial and research resources. When the public

feel threatened, nonresponse rates increase, data collection becomes more expensive, and respondents sometimes provide inaccurate data, to mention a few of the adverse effects. The increased use of record linkage fuels the uneasiness many respondents feel. Privacy and confidentiality are usually heated issues and the media often exploits the concerns and fears that the public already have. Many programs in official statistics depend entirely on the public's willingness to cooperate. Disclosure avoidance measures such as suppression, data distortion, and rounding help safeguard the public's trust in national offices. These kinds of technical measures must be complemented by legislation that further protects the individual, demonstration of the genuine needs for the data collected, making access to statistical data every citizen's right, etc. The literature on confidentiality issues is vast and contains contributions by statisticians, computer scientists, politicians, lawyers, and journalists. Despite the voluminous literature, the research in this area has just begun and suggestions for future research can be found in Cox et al. (1986).

V. Concluding Remarks

The most extensive and costly statistical programs are conducted by government agencies in the production of official statistics. Today these offices find themselves in a strained and vulnerable position. The quality of their work depends heavily on government funds and public opinion. Even relatively minor budget cuts and sways in attitude can precipitate changes in the rapport between the agency and the public. Diminished good will on the part of the public can produce soaring nonresponse rates and in other ways sabotage the successful conduction of a survey. Given this delicate balance, one can easily imagine the havoc that large changes can generate.

Without feedback from users, national offices cannot adjust their statistical products to meet current needs. Utilization has gained little prominence in statistical theory and practice. Not all too long ago, government statisticians did not have to be concerned about the user's needs, they just produced statistics en masse and hoped to cover as many topics as possible. The current situation is much more demanding.

The research areas outlined above are common to all statistical agencies with some local variations depending on the organization, attitudes of the general public and the special needs of a given country. Although industrialized nations have very different needs and interests from developing nations, the basic problems they both face are very much the same. Errors, costs, respondent cooperation, and utilization are universal. For this reason, today's statistical discussion should be carried out in the international community. Research should be shared because the problems themselves are shared. Joint ventures are not uncommon today, but should be planned so that resources are more efficiently used. For example, countries could divide themselves into research blocks and share both the costs and the findings.

Research and methodological work lead to more efficient and rational statistics production. To accomplish this, agencies need to hire more mathematical statisticians. One might think that agencies abound with mathematical statisticians, but this is not the case. There is a shortage of this type of personnel. Many problems are solved superficially, like they usually are solved, or not at all, and this can prove devastating in the long run.

In this paper, we have pointed out a number of areas that need methodological and theoretical advances. Official statistics continuously faces new problems that cannot always be dealt with by traditional theories and methods. Today there is inadequate collaboration between university and agency researchers. Future research should concentrate on specifying relevant statistical needs, developing new data collection procedures, and solving measurement problems. The concept of total survey design should become a standard way of working, taking both sampling and nonsampling aspects into account when designing a survey. The new research on the use of models, administrative records for statistical purposes, confidentiality, and record linkage should be put into use as fully as the basics of statistics has been used. It is vital that national offices find adequate funds for the implementation of these efforts.

Finally, we would like to mention a few references that discuss official statistics and the relationship between official statistics and the advances in theory and methodology. In Dalenius (1982) a sample of ideas for sample survey research is provided. In Barnard and Plackett (1985), Bjerve (1985), Malinvaud (1985), and O'Muircheartaigh and Wong (1981) stimulating discussions on theoretical discussions and official statistics are found. A review of the impact of computers on survey methodology and techniques is provided by Lyberg and Sundgren (1987).

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SUMMARY

The demands on and needs for official statistics are steadily increasing. At the same time, the statistical agencies responsible for official statistics can no longer count on receiving the funding or the public cooperation they need to produce these statistics. Recent advances in statistical theory and methodology have led to improvements, but these improvements cannot completely compensate for the losses brought about by budget cuts and nonresponse. In this paper, we try to structure the issues, provide some examples of areas that need development and research, discuss factors that are beneficial or detrimental to future official statistics and provide suggestions for research.

RESUME

Alors que les demandes et les besoins en statistiques officielles progressent avec constance, les agents responsables ne peuvent plus espérer recevoir tout le financement ou le soutien public nécessaires à la production statistique. De plus, les améliorations qu'apportent les récents développements théoriques et méthodologiques ne compensent pas complètement les pertes imputables aux réductions budgétaires et à l'insuffisance de la coopération publique. Cet exposé présente des solutions de structuration et des efforts de recherche et de développement importants dans certains domaines, discute des facteurs bénéfiques et préjudiciables au développement futur des statistiques officielles et avance des suggestions pour poursuivre la recherche.

Invited Paper 6.3
46th Session of the ISI

ON THE STATISTICIAN'S CONTRIBUTION TO QUALITY

W. Edwards Deming

I. Need for quality

American industry dominated the world for decades. Exports of manufactured product were at a high level for a decade after the War. The War had demolished the rest of the industrial world. The world waited in line to buy whatever North America could produce. Everyone in America expected the good times to continue. Instead, came decline. What happened?

The U. S. has suffered ever increasing deficit in trade for twenty years. Export of agricultural products has in the past helped to defray our deficit, but no longer. Customers that buy our wheat are complaining about dirt and poor quality. Imports of agricultural products to the U.S. are now equal to exports, and would show a deficit were figures on imports of illicit drugs available for the balance sheet.

The basic cause of the decline is that the quality of many American products is not competitive, and never was. Mass production, generations ago, was a contribution from America toward better living the world over. Quantity was important; quality was not. Today, the problem in America is quality. The purpose here is to start to learn what to do to improve quality.

Devaluation of the dollar against the yen is a disappointment, as anyone could predict. If I wish to sell this table, and nobody wishes to buy it, reduction in price will not sell it.

Devaluation of the dollar is not the road to better business. Better quality is. We are in a completely different position than we were in during the good times after the War.

The ills of American industry come from wrong styles of management. Unfortunately, wrong styles of management move freely across the international borders.

Wrong styles of management, and bad practices have grown up and taken root in the Western World. They must be blasted out and replaced by new construction, directed at quality and productivity. Emphasis in America has lately been on finance, the quarterly dividend, manipulation and maneuvering of assets. Traditional ways of doing business must change. For example, advances in quality require long-term relationships between customer and supplier, and abandonment of traditional ways of doing business on competition by price tag. Quality must be stable and capable, with continual improvement.

II. Examples of bad practice

Top management abandoning their responsibility for quality, occupied with finance, quarterly dividend, price of the company's stock, churning money, short-term planning, suboptimization.

Lack of policy for quality. Quality, if it is to exist, must be directed from the Board Room. Quality requires operational definitions at every stage, including the requirements of quality for the customer. Quality requires organization for quality. (Page 467 of OUT OF THE CRISIS, Center for Advanced Engineering Study, Massachusetts Institute of Technology, 1986). Organization for quality requires profound knowledge of statistical theory.

Incentive pay.

Doing business on price-tag, on the supposition that the performance of two items that meet the specifications will be equal and that competition solves all problems.

Detailed action on reports of people, quality, sales, complaint of a customer, overdue account, etc.; instead of action in the board room directed at improvement.

The annual appraisal of performance, or the so-called merit system. Of all the forces of destruction that have beset American industry, this one has dealt the most powerful blow. It destroys people, our most important asset. Ways are clear toward better administration.

Management by objective. Management by the numbers.

The supposition that quality follows inevitably from hard work and best efforts.

The supposition that quality is assured by improvement of operations, solving problems, and stamping out fires.

III. Failure of management to accept responsibility for quality.

There is prevalent the unfortunate supposition that improvement of quality is assured by improvement of operations. The truth is that all operations in a company may be carried on without blemish while the company fails, producing very well a product with no sale.

It is a mistake to suppose that quality can be achieved solely by hard work, by best efforts, by improvement of operations, solving problems, stamping out fires.

Hard work will not ensure quality. It is necessary to understand the theory of management, then put forth best efforts. A theory of management now exists.

It is obvious that experience is not the answer. The U.S. ranks highest in experience, measured in man years. Experience by itself teaches nothing unless guided and compared with theory of subject-matter and statistical theory.

Gadgets, automation, computers, information power, robotic machinery, high technology, are not the answer, nor zero defects. Much new machinery turns out to be the source of headaches and high cost. Money will not buy quality. There is no substitute for knowledge. New machinery should be planned in accordance with the theory of management. The possibility to make changes to improve processes must be built in.

Satisfied customers are not the answer. A satisfied customer may switch. Profit and merit come from loyal customers. A loyal customer waits in line and brings a friend with him.

It is the obligation of the producer to foresee the needs of his customer, and to produce for him new design, new product, new service.

We in America have been sold down the river on competition. Competition in the right place is essential, but competition in America has been over-extended. Management of companies do not work together on common problems, fearful of the Anti-Trust Division. Worship of competition broke up the telephone system that we enjoyed, perhaps our only exhibit of world quality. We have now no telephone system, no one responsible for the quality of service.

IV. Changes required in the teaching of statistics

Respect for the statistical profession amongst scientists, engineers, and professional people has followed a monotonic decreasing sequence for 40 years. At the same time, industry has ever-increasing need for statistical help. Unfortunately, the gap between supply and demand for statistical work widens by the month.

What is wrong? The answer lies in the teaching of statistics. Here are some suggestions for change in the teaching of statistics to engineers and to students of the natural sciences and the social sciences, and in schools of business.

1. Distinction between enumerative studies and analytic studies (to be explained further on). Error and loss from use of theory for enumerative studies for analytic problems.

2. Distinction between common causes of variation and special (assignable) causes. For example, the distinction between common causes and special (assignable) causes of variation--i.e., between a stable system and an unstable system--is vital for improvement of quality. The responsibility for improvement of a stable system rests with the management, whereas identification of a special cause and its removal is usually best attempted at the local level.

3. Losses from tampering with a stable system. Demonstration by use of the Nelson funnel. Examples: (1) worker training worker; (2) executives working together without guidance of statistical theory. (3) sharing ideas without guidance of statistical theory. (Deming, OUT OF THE CRISIS, Massachusetts Institute of Technology, Center for Advanced Engineering Study, Cambridge, Mass. 02139, 1986, pp. 327 ff.)

4. Organization for statistical work (Ch. 16 in the author's book, OUT OF THE CRISIS).

V. Enumerative and analytic studies.

A frame is necessary for an enumerative study. A frame is composed of sampling units, any one of which may be drawn into the sample for investigation. A simple example is a list of accounts receivable on a certain date.

The second step is to understand the concept of the equal complete coverage, defined as the result that would be obtained by investigation of every sampling unit in the frame, by use of prescribed methods, definitions, and care. The aim of the sample drawn from the frame is to estimate what would be obtained were the equal complete coverage to be carried out.

In contrast, an analytic study is one in which material made yesterday may furnish information by which to improve a process. A time-honored example is last year's crop, studied with the aim to improve next year's crop. In industry, one studies the performance of material made in the past, or service delivered in the past, with the aim to learn about the effect in the future of a proposed change in the process.

A proposed medical treatment will be tested on human beings or on animals in an attempt to provide better treatment in the future.

The theory of probability applies only to the random variation of a repeatable operation. This condition is met for practical purposes in an enumerative study if random numbers are used for selection of samples. A confidence interval has operational meaning and is useful in an enumerative study.

In contrast, the economic and physical conditions that governed an experiment or test carried out last week, or the product of last week or last year's crop, will never be seen again. We must conclude that for an analytic study, any material that we test to aid us in planning is a judgment sample, not a random sample. There is, in an analytic study, no equal complete coverage, hence no random sample, error yes, but no standard error, no confidence interval.

Statistical theory for analytic problems has not yet been developed.

The only possible exception exists for performance or product that comes from a stable system, one that is demonstrable in statistical control. Prediction of the statistical characteristics of future product may then be calculated by the theory of estimation applies to last week's product as if it were a sample drawn by random numbers.

The variance of the mean of samples of size n drawn with equal probabilities from a frame of N units for an enumerative study has the finite multiplier $(N-n)/(N-1)$, which decreases to zero as the size n of the samples increases toward N. There is, in contrast, in an analytic problem no finite multiplier, no way to reduce to zero the error of prediction.

A test of the hypothesis that Treatments A and B are equal has no place in the requirements of industry and science. We know in advance that A and B will be different. We can almost always be pretty sure, by knowledge of the subject-matter, that B will be better than A. The only question is how big will the difference be? Will it be big enough to warrant the cost and risk of a change? The theory of probability furnishes no operational answer to this question. We proceed by degree of belief, which has no numerical measure: it is not .99, .95, .90, .80, nor any other number.

VI. More detail on enumerative and analytic studies

The following pages are notes that I use at New York University in a course in statistical inference, to illustrate some of the properties of enumerative and analytic studies. It may be of interest to note that the preparation for a complete coverage and the preparation for a sample thereof for an enumerative study follow identical steps except for design of the sample. Likewise, the preparation of tables of results, and the conclusions to be drawn from the results, are identical except that for a sample, the possible uncertainties in the results will include a margin of sampling error (confidence interval).

The equal complete coverage will be afflicted with mistakes, wrong entries, missing information, errors of response, care and carelessness of interviewers and of other people that work on a study. A sample (which means a sample of the equal complete coverage) will be afflicted likewise.

VII. Enumerative studies

A problem exists. In the opinion of experts in the subject-matter, study of a proposed frame would produce information that is needed.

E, responsibility of the expert in the subject-matter.

S, responsibility of the statistician.

Task	Same or different in complete count or sample less than 100%	Responsibility
A problem exists. It is thought by the management of a company and by experts in the subject-matter that statistical data that refer to certain material (people, households, accounts, business establishments, area or areas) would throw light on the problem. For example, how many people reside in an area? how many people reside in each of a number of areas? How many children of school age are there in each area? What is our share of the market? What is the net worth of our accounts receivable? How many accounts by size of account are over four weeks overdue? How much LTL-traffic in general freight is there (number of shipments, or total cwt-miles hauled) between Chicago and Philadelphia?	Same	E
What tables do we wish to present? Draw up some simple dummy table-forms, with title, heading, and stub. Try to put in the important classes and characteristics that will be of interest. These table-forms are of course subject to revision.	Same	E, S

These dummy tables and a careful statement of the problem will define the universe. The universe is the people, patients, institutions, organizations, establishments, accounts, soils, etc., that are at the root of the problem. Actually, the results of an enumerative study are valid only for the frame that will respond or otherwise yield the information sought.

Task	Same or different in complete count or sample less than 100%	Responsibility
Frame and choice of sampling unit. The frame is a means of access to the universe, or to enough of it to warrant carrying out the study. The frame consists of sampling units, any of which may be drawn into the study by a random number.	In both sample and complete count, the sizes of the sampling units should be related to some unit of time (day or week) for an investigator, and related also to ease of supervision.	E, S
Definitions.	Same	E
The questionnaire or method of test.	Same However, tests to compare two competing versions of a question or of a whole questionnaire is best treated by appropriate statistical design.	E, S
How to fill out the questionnaire or other forms.	Same	E, S
Steps in planning to ensure reasonably near optimum use of abilities of (a) people in the organization that will carry out the study, and (b) physical facilities for collection, processing, supervision, etc.	Same	E, S
Instructions for investigators. Training. Rules for conducting an interview, including call-backs. Rules for inspection.	Same	E, S
Hiring of interviewers or inspectors	Same	E, S
Discovery of investigators that appear to be out of line, and are candidates for re-training or for replacement	Same	E, S

Task	Same or different in complete count or sample less than 100%	Responsibility
Instructions for supervision.	Same, except that for a sample of areas the supervisor must verify the coverage of segments.	E, S
Statistical aids to supervision.	Same	E, S
Controls to discover and measure	Same	E, S
Units missed. Units included twice. Wrong information elicited. Variances between interviewers. Variances between sampling units within interviewers.		
Coding.	Same	E
Tests of the coding.	Same	S
Tabulations.	Same, except that the sampling variation must be computed for a sample.	E, S
Evaluation of the chief uncertainties in the results.		
From random variation	The random variation should be much less in a complete coverage than for a small sample.	S
From non-sampling errors		
Non-response	Same	S, E
Blemishes of various kinds, discovered in the controls, and by outside comparisons.	Same	E, S

It is the statistician's obligation to point out the limitations of the conclusions that can be drawn from the results.

Task	Same or different in complete count or sample less than 100%	Responsibility
Cost	Usually much smaller for a small sample. The statistician can help in the planning-stages by laying out, with help from experts in the subject-matter, several alternative plans of different scope. With help, he can show for each plan a rough cost and calculation of possible expected standard errors for characteristics of chief importance. This will give the experts in the subject-matter a chance to plan for maximum benefit from the expenditure of time and money.	
Time between date of study and appearance of results.	Usually much shorter for a small sample.	

VIII. Analytic studies

A problem exists. It is thought by the management, or by the people on the job, or by experts in the subject-matter, that a change in procedure would bring better quality and higher yield in tomorrow's run, or in next year's crop.

In an enumerative study, action will be taken on units of the universe. In an analytic study, action will be taken on the process that produced the material studied, with the hope to improve units yet to be produced.

The aim of an analytic study is to aid prediction of the behaviour of a process, to aid plans for improvement of tomorrow's run or of next year's crop.

Planning requires prediction. One may have to plan with a little degree of belief in the predictions that he would wish to have in hand for planning, or he may be fortunate with strong degree of belief in some of the predictions. Degree of belief can not be measured in numbers. It is not .90 nor .80 nor .95 nor any other number.

Better knowledge of a process means enhancement of the degree of belief in the prediction of its performance, and a better basis for planning. There is no sure way to predict the results of a change. Empirical evidence is never complete.

Statistical theory as used in an enumerative study, such as the theory of estimation, statistical tests of significance, the t-test, F-test, chi-square, goodness of fit, do not provide measures of degree of belief in a prediction. Tomorrow's run, or next year's crop, will be governed by conditions different from those that governed the data from a study of the past. Test of hypothesis and tests of significance belong to the philosophy of some other world, not this one.

The only exception is data from the output of a stable process, one in statistical control. The theory of estimation, as used in an enumerative study, applies in all its glory to lots yet to come from a stable process, provided the process stays stable. Lots, and samples drawn by random numbers from lots, behave as samples drawn from a frame. A sample that is big enough will predict with a high degree of belief the statistical characteristics of lots to come tomorrow from the same process.

Unfortunately, a stable process must be created and demonstrated. Moreover, a process that is stable today may not be stable tomorrow. Stability must be charted, and any special cause detected by statistical signal should be identified and removed.

Data from an experiment can not qualify as output of a stable process. Last year's crop in a certain area did not come from a stable process. The environmental conditions of last year (rainfall, weather, soil) will never be seen again.

One may use graphical displays to look for repeated patterns of response to forces that by knowledge of the subject-matter may be suspected or expected to influence response. One may look for repeated patterns of reaction and interaction that seem to persist in replication after replication, and from trials under different environmental conditions.

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Invited Paper 11.1
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A Sample Census: A Valid Alternative to A Complete Count Census?

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1. Introduction

Throughout recorded history, censuses have had an important place in cultural and national affairs. Historically, taking a census has meant attempting to count every person. However, in recent times, there have been developments that call into question the need to count every individual. These developments include statistical sampling, administrative record keeping, and advances in technology. As a result of these changes, alternatives to complete count censuses have become technically possible, and there has been increased discussion of alternatives.

This paper reviews one such alternative -- the sample survey approach. The discussion is focused on the United States of America, but some of our findings are generalizable to other nations. The paper first presents an overview of the decennial census in the United States, then describes the major uses of census data, follows with an introduction to sampling in the U.S. Census of Population and Housing since 1940, and concludes with an analysis of the advantages and disadvantages of conversion to a sample based census.

1.1 Concerns About Censuses

Every 10 years a Census of Population and Housing is conducted in the United States. In planning for each census, the U.S. Census Bureau staff grapples with the three part dilemma of keeping the cost at a reasonable level without sacrificing accuracy, and meeting the legal requirements of providing counts to the President by December 31 of census years (years ending in zero), the States by April of the following year, and generally satisfying the needs of data users by releasing data in a timely fashion. These three concerns generally are shared by statisticians around the world.

While concerns with cost, accuracy, and timeliness certainly have driven the continuing discussion about alternatives to a complete-count census (the 1980 census cost 1.1 billion dollars, and the 1990 census is expected to cost at least twice as much in unadjusted dollars), two other things have served to pull the assumptions underlying a full census closer to the surface for scrutiny. One is the growing reliance on census data at all political levels and by widely differing interest groups. The second is the need for data on a more current basis than is usually available from a full scale periodic census. The result of these events has been a demand for more accurate small area data at smaller time intervals than once every 10 years. The vehicle most often suggested to deliver this improvement has been the

sample survey.

1.2 Overview of the U.S. Decennial Census

The Population and Housing Census in the United States was authorized by the U.S. Constitution in 1787 to be taken every 10 years as a full enumeration. The first census was taken in 1790, and the constitutional mandate has been met each decade since that time through 1980. The next complete head count will occur in 1990, and will mark the 200th anniversary of census-taking in the United States.

Although throughout the 200 years of census taking in America there have been many changes in procedures and census questions, the basic framework of the census has remained unchanged because of its role in apportioning political strength among the states, and its value as a provider of information about the progress of our society.

For more than 100 years following the first census, the United States Congress designated census procedures and acted independently on census data for apportionment. Toward the end of this era, Congress began to grant authority and discretion to the executive branch of the Federal government and to accept the value of scientific and statistical expertise in census work.

The first decade of the 20th century marked the real expansion of organized scientific inquiry in the decennial census. In the first few decades, the Census Bureau was preoccupied with establishing its autonomy in technical matters and regularizing its statistical activity. The main emphases were on analysis and presentation of statistics, and improving field operations.

Major innovations in census procedures began in the late 1930's when a large number of university graduates entered the U.S. Government, and the Census Bureau. This new generation of statisticians introduced sampling in the 1940 census, and applied sampling theory to current surveys. They studied a wide range of sources of error in census results, including enumerator variance, coding error, vacancy checks, post-enumeration post office checks, and coverage error.

These studies indicated that enumerators, coders, and other groups can add serious biases and variances in census data. Accompanying this understanding has been a desire to trade-off some kinds of error (nonsampling error) for those that may be less serious (sampling error). This trade-off is in fact one of the assumed benefits of the point of view that there should be less counting and more estimation in the census. It is a conviction of some that there would be less error in the final census results if the data were the product of a combined process of counting, sampling, modeling, and estimating. Accompanying this view is the belief, not yet substantiated, that the census also would be done at a lower cost and data released in a more timely fashion.

2. Why We Take a Census -- Data Uses

Although the original motive for decennial enumeration was the unitary aim of reapportionment between the States for the U.S. House of Representatives, the more general rationale today is probably best described as statistical, that is, to meet the many data needs of the United States. The answer to the question "Can A Sample Census Be a Valid Substitute for A Complete Count Population Census?" not only firmly linked to the possibilities of lower cost and improved accuracy and timeliness, but is deeply intertwined with the uses to which the data are applied.

Briefly outlined, the major uses of census data in the United States are:

- Apportionment, or the allocation of U.S. Representatives to each area entitled to such representation.
- Districting, or the creation of election districts within states, for U.S. Congress, State legislatures, or local precincts.
- A basis for Federal legislation affecting the distribution of Federal funds for many programs.
- Statistical Benchmarking.
- Planning.
- Business Research.
- Various other uses from genealogical research to birth verification.

The need for reliable data for small areas or domains dominates each of these uses, except the last, which requires information about individuals. Many programs require population data for small geographic areas for their proper administration and the appropriate distribution of funds. It is difficult to make accurate estimates of the population of small cities or counties, and even more difficult for smaller areas. Faced with a sample census as a substitute for a complete count census, users would have to decide what level of error they could accept. First, the question of the amount of error acceptable in apportioning the House of Representatives and redistricting state legislatures would have to be addressed. Then, local officials must consider the effect on funds allocation, health planners whether sample data will be accurate enough for their needs, business investors whether they will have reliable small area estimates and projections, and statisticians the implications of using sample estimates as benchmarks for preparing projections or redesigning sample frames. At a more individual level, genealogists would have to consider the effect on census records of the future, and people without birth certificates would have to realize that the census may or may not be able to provide birth information.

Answers to data use concerns at the present time are not clear-cut. In giving close scrutiny to the sample-based census concept, concern is always expressed about data accuracy at small geographic areas. A great deal depends on what the Census Bureau

and others interested in these problems are able to learn over the next few years.

3. Sampling in the Census -- 1940 TO 1980

3.1 1940 Census

Whereas survey sampling as a substitute for the Census of Population and Housing would be a radical departure from our historical method and purpose, limited sampling in our census does have precedence. It was not until the 1940 census that the Census Bureau relied significantly on modern sampling methods. Three major uses of sampling were introduced at that time. The first was a 5 percent sample of the population for which information was obtained on items, such as usual occupation and industry and language. The other two uses of sampling concerned analytic studies and quality control procedures of clerical coding, editing, and keypunching.

3.2 1950 Census

A major change in the use of sampling took place in the 1950 census, which grew out of a change in attitude regarding sampling. Whereas in the 1940 census sampling had been considered applicable only for secondary items, in 1950 the entire range of census activities was examined to determine where sampling could be used. As a result, information was collected from a 20 percent sample of persons for more population characteristics than in 1940, and for the first time many housing items were collected on a sample basis, although a core of population and housing items were counted on a 100 percent basis. Additional uses were made of sampling for preliminary tabulations to permit the publication of early data, in controlling processing operations, and to evaluate the quality of census data.

3.3 1960 Census

In the 1960 Census of Population and Housing, sampling was further extended so that only a few items were collected on a 100 percent basis, while most of the information was collected from a 25 percent sample of households. However, those items not sampled were complete-counted because of their important social, economic, and political uses: These were major population and housing items required to define the population and a number of housing characteristics used for statistics for very small areas (individual city blocks). In addition, for some programs, 100-percent data were tabulated on a sample basis and sample information was further subsampled. As in the 1950 census, sampling methods were applied to field quality control.

Bureau of the Census Technical Paper 13 (Waksberg and Hanson, 1965) demonstrates the changing attitude about the uses of sampling in the census between 1950 and 1970. The evaluation of 1950 and 1960 census results by Waksberg and Hanson indicated that for a characteristic describing about 500 people in an area

of 2500 persons, the increase in root mean square error arising from sampling variability was only about 25 percent. For larger areas and numbers, the increase in relative error due to sampling error was even smaller. They concluded that, aside from population counts, most uses of statistics were not affected in any important way by replacing complete counts with reasonable size samples. They also pointed out that the improvements made possible by reallocation of funds was such that the overall level of error was less than if earlier techniques were used . This became the prevailing view at the Census Bureau.

3.4 1970 Census

Thus, sampling was again used to collect information as well as a tool to control the census operation, in the 1970 census. The sampling unit for the population not living in institutions or group quarters was, as in 1960, the housing unit. All persons living in a sample housing unit were included in the sample. Information was collected from a 20 percent sample of housing units using two different questionnaires, one for the 15 percent and another for the 5 percent sample, based on the size of the area for which statistics were needed and the amount of anticipated detailed cross-classifications in the tabulations. As in 1960, major required population and housing items were collected on a 100 percent basis, and samples were used for quality control and release of some public use data.

3.5 1980 Census

In 1980, two sampling rates also were employed. In most areas of the nation a rate of 1 in 6 was used. However, in incorporated places of less than 2,500 persons, one-half of all housing units and units and persons in group quarters were sampled to obtain more reliable data from these small places. However, again those items sampled were supplemental to the basic information required for every person and housing unit (age, race, relationship to households, number of rooms, and value or rent). Other sampling activity in 1980 included subsampling long-form questionnaires on which the place-of-work and migration data items could be coded, and designating a subsample of enumeration districts to produce provisional estimates of selected geographic areas (called the Early National Sample).

4. Proposals for Substituting Survey Samples for a Census

Based on the trend of the past four censuses, it is clear that the issue is not so much whether there should be sampling, but how much. The degree to which sampling should be part of, or even a total replacement for, a census is a basic issue to be decided by each country, but without question sampling can be at the least a helpful part of census procedures. Recognizing there are many potential uses of sampling in a census, such as quality control, follow-up, and coverage improvement, the remainder of this paper will look more closely at sampling for the count, and will address advantages and disadvantages of a regular sample

survey taken at one time, in snapshot fashion, as a substitute for a census, and rolling cumulative samples taken periodically.

The term "regular" sample survey refers to a probability sampling procedure for which the selection of probabilities for the sampling units are known. For a census, this generally implies a single stage systematic sample taken however often needed.

In a cumulative rolling census, data is collected throughout the time frame for cumulation (Kish, 1981, Kish and Verma, 1986). The samples are called rolling because they would cover different parts of each area sample in successive operations. Each monthly or weekly sample represents the geography under count, such as the nation. The procedure is cumulative in that the samples are cumulated to give quarterly, yearly, biennial, quinquennial or decennial statistics. The results are presented as averages cumulated over the periodic collections.

The data can be collected each week, month, quarter, or year. The design in effect spreads a national decennial census over 10 yearly sample censuses, or 120 monthly samples, or 520 weekly samples. The cumulative rolling listing procedure emphasizes inexpensive listing of dwellings, but can collect information about persons and characteristics as well. Other simple data can be collected from time to time from a sample of the housing units included.

In evaluating substitution of a large-scale survey sample, of either the regular or rolling type, for a complete count census, we need to consider whether the benefits will really be lower cost, improved timeliness, less respondent burden, and better accuracy.

Because of continuing interest in survey sampling alternatives, the Census Bureau developed a research plan in 1984 to examine the issues surrounding sampling for a census (Jones, 1984). Numerous research projects were proposed to answer questions for a possible design for a sample-based census.

Among the many technical issues determined to need clarification were the appropriate sample design, sample size, sampling unit, stratum definitions, and stratification variables; and the appropriate estimation procedures. (One of the aspects of weighting associated with a sample census is that no complete count population will be available.)

Other issues identified included such problems as impact on processing and publication, education of data users, handling of special places, such as jails and nursing homes, evaluation of results, relative impact on housing and person counts, allowances for avoiding disclosing identities of individuals, and effective public education. All of these issues and others were determined to require thorough investigation as a first step to evaluate substitution of a regular sample survey for a complete enumer-

ation. However, the most serious impediment to adopting a sample-based census was coverage error. Our analysis indicated that substantially poorer coverage could be expected from a sample survey than a census.

At the present time, there is no active research or testing of sample survey methods as a substitute for a complete enumeration for the 1990 census at the U.S. Census Bureau. The current reluctance to pursue this course is linked to the net losses, or disadvantages, that would accrue from sample surveys, as discussed below. However, there are some clear benefits that can be tallied as well.

5. Advantages of Sampling for the Complete Count

5.1 Lower Cost

Because of the high costs of contacting most households in the census (about $11 per housing unit in 1980) it is natural to assume that not having to contact every household will reduce costs. At the present time, it appears that survey sampling would decrease costs, but not as dramatically as might be expected for the following reasons.

First, there are overhead costs, such as the cost of sampling and the cost of enumerating the proper units. In addition, certain costs are about the same for a complete count as a sample census (such as publicity, preparation of training manuals, etc.).

Secondly, while there is intuitive appeal to the notion that contacting fewer households will reduce travel costs, the reduction may turn out to be smaller than anticipated. For example, for both the sample and census methods, an enumerator would drive to the location and collect data from the housing units. For the census enumerator, there can be efficiencies in contacting a number of nonresponding households in a small area on any one trip. Nonresponse from sample housing units may well require repeated return trips by the sampling enumerator, because of the singular importance of the unit to the sample, and the distances between nonresponding sampling units would be far longer than for their complete-enumeration counterparts.

5.2 Increased Accuracy

Along with the concern about cost is concern about accuracy of census data. The argument for a sample-based census states that the total error of a survey could be close to or less than the total error of a census. A census is not subject to sampling error, as is a survey, but both are subject to nonsampling error. Because sources of nonsampling error are more controllable in a survey than a census, the theory is that the accuracy of a survey could approach, or exceed, that of a census.

There is little doubt anymore that a well controlled sample for a total population count could be as accurate, or even more accurate, than a complete enumeration because of the reduction in nonsampling error achievable through the development of a permanent, well trained, and well managed field and clerical staff. However, when the demographic focus switches to data for smaller geographic areas for smaller populations, sampling error rises dramatically. A complete count census has many advantages for small area estimates.

5.3 More Timely Data

Perhaps one of the more damaging criticisms of any decennial census is the slowness in getting data out. In the United States, the census is taken in April of the ten's year, and population totals for the nation are released by December 31 of that year. This is the first data to be released. Then counts for the States to use for redistricting are released by April. From then on, data is made available as it is ready. However, data for researchers and planners may take up to 3 or 4 years for public release. The 10 years from 1983 to 1993 represent an aging of 13 years, and everyone recognizes that important biases are associated with those delays. Accepting the validity of these observations, can a sample-based census be expected to do any better, that is will data release be more timely?

The major advantage of survey sampling in so far as improved timeliness is concerned is that there is less data to process. This means that there are fewer questionnaires to check, less data to enter, by keying or other means, fewer response inconsistencies to resolve and so on. On the other hand, there are parts of the tabulation process for which quantity of data is not a time factor. These include such activities as computer programming, table construction, printing, and final stages of consistency review. On balance, tabulations from a sample census would be available earlier than from a complete count census, but again, the time saving may not be as large an anticipated.

5.4. Respondent Burden

Sampling also reduces the aggregate time the public must spend filling out questionnaires as well as the survey cost associated with this activity. This is why respondent burden reduction has historically been an important justification for obtaining many informational items from household samples. Another possibility is that increased use of sampling for content, with the accompanying reduction in respondent burden, could have the benefit of improving response quality. Counterbalancing these gains is the possibility of citizen confusion about whether or not they are in-sample and their responsibilities to resolve such conflicts.

In summary, a consideration of sample survey for complete enumeration methods has indicated that samples can reduce cost, reduce average respondent burden, and provide somewhat more

timely data. Most importantly, for estimates of total population, sample surveys can be as accurate as complete counts. However, not all is positive. There are some significant disadvantages as well. These are discussed in the next section.

6. Disadvantages of Sampling for the Complete Count

6.1 Small Area Data

Censuses are often the only comprehensive source of data for very small geographic areas such as small towns, census tracts, and city blocks. There are important needs for data that simply could not be met by either a one time or cumulative rolling sample. These include redistricting of national, state, or local legislative districts, private sector purposes such as market segmentation and market planning, and many other public planning uses.

To obtain small-area population counts and basic characteristics from a sample survey to satisfy users in the United States with an acceptable level of accuracy might require a sampling rate of 50 percent or greater for small jurisdictions. At that point, there is not much difference between a sample and complete count census. It would not be acceptable to design a clustered area sample that included the population of only some areas, such as selected counties or cities, because small-area data are needed for every political jurisdiction in the country. The use of administrative data to obtain acceptable estimates of change presupposes the existence of data at a point in time to which the administrative data can be linked. A cumulative rolling sample, for which each small area is enumerated at a different time, could solve some of these problems. However, having to combine data from different time periods to obtain sufficient sample size introduces some complex data analysis problems.

6.2 Small Populations, Rare Characteristics

A similar problem exists for data for small populations or rare characteristics. In addition to the count of persons and basic characteristics, the census obtains detailed data for many other characteristics for small areas and subgroups. The 1980 Census of Population and Housing included over 30 population and 30 housing items covering a broad range of topics; census products cross-tabulated these items in a variety of ways. As a result, a census provides many more analytically relevant explanatory variables than most administrative record systems or surveys. The detail a census provides can be cross-tabulated at appropriate geographic levels in many ways without adversely affecting reliability or raising confidentiality concerns. As a result, a census is virtually the only source of characteristics and totals for very small groups in the population.

6.3 Implication of Coverage Error

At this time, the most difficult impediment to adopting a sample-based census is coverage error. Based on our own analysis of issues related to a completely sample-based census, we have reached the conclusion that a sample census as a substitute for a complete enumeration is unacceptable because of the substantially poorer coverage compared with a complete count census. Net error coverage is an issue of great importance in the United States. The expected lesser coverage obtained by a sample census would have adverse implications for many important uses of census data. Substituting a sample survey for a census will deepen concern about differential undercoverage (differences in undercounts by age, sex, race, ethnic group, and geographic area). Also, less complete coverage will adversely affect benchmarking for the design of other surveys and current population estimates.

6.4 Public Support

A census is a unique statistical and social undertaking. In the United States, it is the only data-gathering operation that is mandated by the Constitution, and the only one that produces a broad array of information on the American people and their housing. As a social phenomenon, it is the only undertaking that attempts to include every person in the United States, and, thereby generates a sense of national ceremony when done every 10 years . It is doubtful whether the national ceremonial mood could accompany a regular sample survey or a rolling sample. The activity might well change in the public eye from a national ceremony to a statistical undertaking that may or may not involve most of the residents of the country, such as is apparent in the conduct of the Bureau's other large-scale surveys. We believe the sense of national ceremony generated each 10 years is largely responsible for the high mail-return rates we achieve.

As discussed earlier, there is a large body of evidence in the United States and other countries that a census obtains more complete coverage than sample surveys. One possible reason for this finding is that the publicity surrounding a census elicits greater cooperation than can be obtained in surveys, which generally are not accompanied by a publicity campaign. Public cooperation is essential to the conduct of a good census. The public must understand the important uses of the census, trust in confidentiality of the data, and act on this understanding and trust by including themselves in the census. To achieve these goals, the U.S. Census Bureau has depended on a promotion campaign.

A formal evaluation of the publicity campaign used in the 1980 census showed that it was extremely effective in increasing awareness of the census. In addition, the campaign significantly increased knowledge about the census among lower-income Black and Hispanic households, and had a positive effect on the mail response behavior of these households.

While, of course, the Census Bureau could mount a publicity campaign for a sample census, it would be difficult to include a question like "Were You Counted?" when only a fraction of the population is to respond. With a sample survey, people would not know whether they were included until counted by the Census Bureau. Therefore, publicity would lack salience for most individuals. The methodology of cumulative rolling samples would make a national publicity campaign unnecessary, but would require thousands of mini-campaigns in the areas in which the rolling samples were taken.

6.5 Legal Issues

The substitution of sample for census data is statistically and operationally problematical, but a legal impediment exists at this time in regard to U.S. Congressional reapportionment -- the reallocation of representatives to each entitled area. The vital link between the decennial census and the United States Government is found in the U.S. Constitution, Article 1, Section 2, which reads:

"Representatives...shall be apportioned among several states which may be included within this union, according to their respective numbers..."

The authorizing legislation for the U.S. Census of Population and Housing is contained in Title 13 of the United States Codes. Section 195 was added to Title 13 in 1957 and modified in 1976. The 1957 language of section 195 merely prohibited the use of sampling "for apportionment purposes," whereas the 1976 revision specified "apportionment...among the several states." As it now stands, there is a prohibition on the use of sampling for purposes of reapportionment. There does not appear to be a prohibition on the use of sample information for districting within the States. Substitution of sample data for full-count census population data would require legislative change, which conceivably would instigate a constitutional challenge in which the U.S. Supreme Court would make a final determination.

6.6 Birth Verification and Genealogical Research

During the 19th century many western countries introduced continually updated systematic registration of the population in population registers, and many other countries adopted this practice in the 20th century. Although civil registration was introduced in the Colonies of Massachusetts Bay and New Plymouth in the early seventeenth century, the United States never developed the tradition of a central population register (even statistics of registered births were not available from all states until 1933), and it does not appear that one will be developed in the foreseeable future. For nations without central registration systems, censuses serve vital birth verification and genealogical research functions.

The U.S. Census Bureau employs a staff to search the Federal censuses of population, from 1900 on, and provides personal data from these records to individuals who lack other documents of birth or citizenship. Extracts from these records are often accepted as evidence of age and place of birth for obtaining employment, social security benefits, old-age assistance, passports, naturalization papers, or relationship to other persons.

As time passes, an ever-increasing proportion of the population has been born in the period during which birth registration at the State level is virtually complete. By the 1990 census, reliable information on births will be available for most residents age 55 or younger, nearly 80 percent of all residents. A fairly small group will remain with less reliable sources of birth registration. Still, approximately 240,000 individuals use this service each year. The benefit these records provide would be missed if a complete count census were dropped in favor of sample surveys.

The complete count census also is a chief source of information in the United States for genealogical research. Copies of census schedules from 1790 through 1910 are available for research at the U.S. National Archive and various libraries. Subsequent records are closed to the public for 72 years to protect the confidentiality of the information they contain. A sample-based census would virtually eliminate the usefulness of the census to future generations for genealogical research. Of course, for countries with administrative registers, these are lesser concerns.

6.7 Accuracy Verification

In 1970, about 60 percent of the U.S. population was enumerated under a mail census, the first time a mail census operation was conducted, and the operation was so successful that in 1980 the mail census was expanded to cover approximately 95 percent of the population. The mail out/mail back census is also planned for 1990.

The basis of the mail census is the preparation of an accurate address list and the self-enumeration of persons who receive a questionnaire. This model would remain unchanged in the advent of a sample-based census. In the early development of the mail census, it was recognized that a single procedure for address list compilation would never result in the best possible census. Thus, the principle of redundancy or of numerous checks and reviews was adopted. This multiple check approach was applied to minimize the overall error in the census taking process, and would be necessary for a sample census as well. In light of an undercoverage problem in list-and-enumerate areas, called conventional areas, coverage improvement programs also were adopted.

In 1980, there were 14 coverage programs developed for two broad applications -- address list preparation in mail census areas prior to data collection, and improvement of coverage during data collection. As a result of these coverage programs, approximately 2,600,000 persons were added to the census count in 1980. The introduction of a sample-based census for a complete enumeration clearly would render the use of some coverage improvement programs useless, and compromise the effectiveness of others. As mentioned earlier, a publicity campaign that asked "Were You Counted?" would be useless because in a sample survey most of the population would not be in universe. As another example, at approximately the midpoint of the 1980 census, small area population and housing counts were provided to local government officials to review. Reports of omission were investigated. In a sample census, how would local officials be able to assess the accuracy of the housing count, which would be an estimate? Matching records, such as drivers license files, with census reports to identify possible misses would be virtually useless. The benefit of post office checks in which route carriers check to see if they have a census mailing piece for each address on their route would be lost, because they would not be expected to have census mail for each address. As one last example, the usefulness and cost effectiveness of assistance centers, which in 1980 were established throughout the United States to help individuals fill out the census questionnaire, would be called into question because of the relatively small number of persons they would service. In general, many of the data collection coverage improvement programs now found useful would be voided, although those used to improve the coverage of the address list prior to the census could continue, with minor deletions.

6.8 Use Issues

Another dimension on which to gage the gains or loses from a sample census is usage. Whereas sample results are subject to the same response, reporting, and processing errors which are present in data from complete censuses, statistics based on a sample almost always differ somewhat from figures that would have been obtained if a complete census had been taken using the same questionnaire, reporting, and processing errors. So that sample statistics from the census can be properly interpreted, a statement on reliability always appears in census publications. Full substitution of a sample-based census for a complete enumeration only would result in the extension of sampling variability to the entire data set, with the need to exercise the normal caution in interpreting such numbers, hardly a fatal flaw given that most data elements are now sample items anyway. Additional problems for analysts that would crop up in cumulative rolling samples include the fact that the time at which geographical areas are included in the sample will be chance events, rendering comparison difficult, and the enumeration of each small area at a different time would make the use of administrative data very complex.

Once the issue of the appropriate technical tools has been resolved by the practiced data user, the real sample data usage problem must be addressed: the public perception of what a census is and what a sample survey is not. Taking as an example the apportionment of the U.S. House of Representatives, the question of the amount of error acceptable in estimating thresholds for this apportionment would have to be confronted. Compounding the dilemma is the fact that at the present time, census counts are viewed by many as being without error or as having a level of error that is acceptable . The change to a sample-based census would be viewed as going from a system with no error, to one with (statistical) error.

7. Summary

In the end, the question is: Should a sample census substitute for a complete count census? The question is difficult to resolve, and perhaps there is no right answer for everyone. Each country must make its own decision based on its individual needs and constraints. If a country already has an administrative record system then a sample survey probably is a reasonable alternative to a complete count census. However, for countries without administrative registers, such as the United States, the choice is a more difficult one. For the time being in the United States, we will not substitute a sample census for a complete count census.

For the future, I strongly recommend countries examine the concept of rolling samples originally introduced by Kish. The following types of approach for the United States would have many advantages.

Every 10 years, there would be a complete count census, but the questionnaire would be relatively small. Most questions would be the same, but a few would vary. The advantage of this 10 year "mini" census would be to get complete count data that could be tabulated, and for key information needed for planning and benchmarking. The small set of variable questions would allow for collection of other data that could be tabulated, even for small areas.

Presumably, the cost of this mini-census would be considerably less than the full-scale every-10-year census. The savings could be used for intercensal surveys (rolling samples). In between the mini-censuses, (perhaps every 2 years), there could be a large scale sample survey. Questions on this survey would be for data that change often over time and that require frequent updates. In general, the data would be for larger geographic areas, though with modeling, small area data could be produced. Theoretically, data for successive samples could be added together to obtain tabulations for small areas (the rolling sample approach).

I think this compromise between full scale censuses and sample census gets the best from both and would supply the country with a wealth of up-to-date data, which is necessary in our quick changing world.

Of course, it will be difficult to change to such a system. But the challenge is exciting.

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SUMMARY

Historically, taking a census has meant attempting to count every person. As a result of recent developments, alternatives to complete count censuses have become possible. This paper reviews one such alternative -- the sample survey approach.

Uses of sampling for quality control in the decennial census of the United States from 1940 to 1980 are described. However, the more controversial issue is: Should a sample census substitute for a complete count census? The advantages and disadvantages of regular sample surveys taken at one time as a substitute for a census, and rolling cumulative samples taken periodically are examined.

The article suggests that each country must make its own decision about substituting sample surveys for complete count censuses. It is strongly urged that nations examine the concept of rolling samples. Advantages resulting from adoption of this method in conjunction with a shortened census questionnaire are cited for the decennial census of the United States.

RESUME

Du point de vue historique, réaliser un recensement, c'est chercher à dénombrer chaque personne de la population. Des développements récents ont rendu possibles d'autres alternatives que les recensements exhaustifs. Cet article examine une de ces alternatives -- la méthode de l'enquête par sondage.

Y sont présentés également les emplois de l'échantillonage pour le contrôle de qualité du recensement décennal des Etats Unis des années 1940 à 1980. Néanmoins, la question la plus contestée est la suivante: devrait-on remplacer un recensement par sondage par celui de dénombrement exhaustif? On examine dans cet article les avantages et les désavantages des enquêtes par sondage régulières utilisées à un moment donné à la place du recensement et aussi les "échantillonnages cumulativement roulants", périodiquement réalisés.

On propose dans cet article que chaque pays doit arriver à sa propre décision de remplacer les recensements exhaustifs par des enquêtes par soundage. L'examination du concept de l'échantillonnage "roulant" est vivent recommandée. Les avantages qui résultent du choix de cette méthode conjointement avec un questionnaire abrégé sont cités pour le cas du recensement décennal des Etats Unis.

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THE USE OF COMPUTERS FOR STATISTICAL ACTIVITIES IN DEVELOPING COUNTRIES

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1. Introduction

It is evident that the use of computers by statisticians in developed countries becomes an essential part for their statistical activities. In developing countries too, the trend shows that the use of computers for statistical activities is emphasized, and it shall become an important part for any types of statistical activities in the future.

The aim of this paper is to review, first of all, the current status on the use of computers for statistical activities in all sectors of developing countries, especially in Korea. Next, some difficulties for the use of computers in developing countries are listed and studied. Finally, some suggestions to boost the use of computers for statistical data analysis are presented. For the review on the current status of computer use, such sectors as education, government, business and industry, and other fields are surveyed.

2. Use of Computers in Statistical Education

The use of computers for statistical works in any society depends to some extents on the quantity and quality of educations for statistics and statistical softwares by computers in colleges and universities. In Korea there are total 100 4-year universities. Among them, as Table (1) shows, there are 39 universities which have statistics-related departments.

Table (1): Statistics-related departments in Korean universities

name of department	number of university	number of graduates/each year
statistics	14	915
applied statistics	8	434
computer science & statistics	17	1,034
Total	39	2,383

Table (1) shows that there are a great number of statistics department in universities and many students who major in statistics graduate each year. Therefore, in quantity-wise statistical education is satisfactory. However, there are some serious problems and difficulties in statistical education. I believe that these problems also arise in many developing countries.

(1) In the 39 universities, there are only about 150 faculty members who teach statistics, and only about 1/3 of them have doctoral degrees in statistics. This gives a serious problem for good quality in statistical education.
(2) Not many professors in statistics know how to use statistical packages such

as SPSS, SAS or BMDP, and very small group of professors are capable of teaching computational statistics. This poses some difficulties for educating students in statistical data analysis by computers. Because of this, some universities are not willing to offer courses for computational statistics or statistical software education.

(3) Most of all, the lack of computer facilities is the biggest problem in developing countires. Table (2) shows the computer facilities of 6 major educational institutions in Korea, and 5 leading universities in the world.

Table (2): Comparison of Computer Facilities in Universities (as of June, 1986) : Reference(Mincom(1986))

University	main frame computer	main memory capacity(MB)	computer center staffs (approximation)
Seoul Naitonal Univ. (Korea)	VAX-11/780	6	24
Yonsei Univ.(Korea)	CDC 170	8	32
Korea Univ.(Korea)	IBM 4341	8	38
Inha Univ.(Korea)	MV 10000	8	25
Pusan National Univ. (Korea)	CDC 180	8	21
KAIST(Korea)	IBM 3083	32	86
Univ. of Minnesota (U.S.A.)	Cray 1 & 2 CDC 174	256	200
Univ. of Michigan (U.S.A.)	Amdahl 1200 & 580	256	120
Tokyo Univ.(Japan)	Hitachi 2000	96	140
Grenoble Univ.(France)	Bull-dps 8	70	50
Univ. of London (England)	Cray-IS	96	100

Table (2) shows that Korea universities possess computer facilities which are less thatn 10% of those of leading universities in the world.
Such lack of computer facilities makes students wait long time in the computer center, and discourages students at using computers. Besides these, there are 3 more problems that should be solved for statistical education by computers.

(a) Lack of softwares, packages and consulting system for students.
(b) Lack of computer network among universities and research insitutions.
(c) Lack of professional computer center staffs who understand well about running computer center, about statistical softwares, etc.

3. Use of Computers in Business and Industry

As far as the use of computer is concerned, the business and industry (enterprises) group is perhaps most active in Korea. As Table (3) shows, 72.9% of total computers in Korea belong to this group. However, still small percentage of enterprises (26.7% of total enterprises whose number of employees is greater than or equal to 100) have cimputers. Table (4) demostrates the distribution of enterprises according to the size of employees.

Table (3): Status of computer installation (December, 1985)
Reference (Mincom(1986))

classification	super	large	medium	mini	micro	total	percent
government	15	16	37	26	29	123	5.0
education & research	7	10	43	99	190	349	14.1
finance & insurance	39	35	48	45	31	198	8.0
enterprise	67	103	184	444	1,007	1,805	72.9
total	128	164	312	614	1,257	2,475	100.0
percent	5.2	6.6	12.6	24.8	50.8	100.0	

Remark
Super : above 1.5 million
large : 0.7 - 1.5 "
medium: 0.3 - 0.7 "
mini : 0.1 - 0.3 "
micro : 0.05- 0.1 "

Table (4): Number of employees in enterprises (December 1985)
Reference (NBS(1985))

number of employees	number of enterprises	cumulative total
1000 -	316	316
500 - 999	547	863
300 - 499	870	1,733
200 - 299	1,224	2,957
100 - 199	3,809	6,766
50 - 99	7,774	14,540
30 - 49	9,934	24,474
5 - 29	79,273	103,747

However, it is a good sign that, as Table (5) shows, the average annual increase of computer installation is about 37.2% which is a remarkable development. In particular, the increase of micro-computers is very fast, which means that micro-computers begin to share bigger parts in computer jobs.

For statistical analysis by computers, Korean enterprises are still in infant stages. There are not many statisticians who are employed by business and industry, and who can handle statistical packages. Korean companies have not much employed statistics-major graduates, and still some people think that statistical data analysis does not need professional skills.

Fortunately statistical quality control(SQC) is recently emphasized very much, and some companies begin to use some types of statistical or SQC packages for their immediate use for quality control or process control. this may be a good start for statistical use of computers in business and industry. However, we have the following problems. I believe that we share these problems with other developing countries.

Table (5): Yearly increase in computer installation
Reference (Mincom (1986))

year / class	1980	1981	1982	1983	1984	1985	average annual increase(%)
super	31	42	60	76	105	128	33.0
large	46	66	84	114	137	164	29.3
medium	111	137	174	214	265	312	23.0
mini	143	167	210	318	461	614	34.4
micro	191	221	238	392	678	1,257	49.3
Total	522	633	766	1,114	1,646	2,475	37.2

(1) Computer center staffs in enterprise do not know statistics, and managers and engineers do not know much about computers. therefore, there are lacks of communication between these two groups, which results in no installation of statistical softwares.
(2) Software industry in Korea is in infant stage, and there are not much statistical or SQC softwares written in Korean language.
(3) Most enterprises do not have an organization of statistical data analysis, and they do not hire statisticians much.
(4) About 10 companies have a general statistical software such as SAS, SPSS and BMDP. Some companies use small size of SQC or SPC(statistical process control) packages. This means that most companies do not use computers for statistical data analysis.

4. Use of Computer in Government and Economic Statistics

The statistical orginization in the Korean government is not centralized. The central organization is the National Bureau of Statistics under the Economic Planning Board. This bureau is in charge of all types of censuses(population census, industry census, etc.), some sample surveys and business indicators (price indexes, GNP, etc.). The second biggest statistical organization in the government is the statistics department under the ministry of agriculture and fishery, which are responsible for all kinds of agricultural and fishing statistics. Other ministries have their own statistics departments. For instance, the ministry of labor has the department of labor statistics, the ministry of business and industry has its statistics department of business and industry, etc..

The National Bureau of Statistics has an IBM 4381(16MB) and some useful statistical package such as SAS, SPSS, TSP, X-11, RATS, etc.. Also the Korean Development Institute (KDI), which has an IBM 4361(8MB), helps the bureau in research. However, there are a few statisticians in KDI.

We have the following problems which have to be overcome in the future for the development of statistics and the use of computers for statistical analysis.
(1) The weakest point of government statistics is the lack of research function. There is no research institute of statistics in the government side, and a few doctoral level statisticians work in the government. Hence, some sophiscated statistical works are not studied and implemented. It seems that, at the present time, the Bureau of Statistics has no intention to

recruit professional statisticians, who are not willing to be hired for the public sector, probably because of low salary.

(2) There is no statistical training center in the government. This causes the problem that some level of standard is not maintained for statistical jobs including the use of computers. Even though the Bureau of Statistics has several good statistical softwares, there are not many people who understand the packages and use them properly.

(3) The salary basis of the computer personnels in the Korean government orginization is relatively very low compared with that of enterprises. Therefore, the government organization including the Bureau of Statistics has difficulty in employeeing good computer analysts and progrmmmers. Because of this, the use of computers for statistical analysis is stagnant.

5. Use of Computers in Biostatistics

The field of biostatistics is comparatively less developed as compared with the fields of industrial and economic statistics in Korea. Even though theres are 39 universities which have statistics-related departments, there is no single university which has the biostatistics department. It seems that medical, public health and phameceutical students do not experience proper education in statistics. Most phamaceutical companies still have not employeed statisticians, and they do not use statistics much for manufacturing drugs and research for new drugs.

The Korean Institute for Population and Health seems to use statistics to some extent, which has a Perkin-Elmer computer(2MB), and SPSS and SAS packages. However, due to the limitation of computer memory size, this institute does not use statistics extensively. Korea has the following problems in biostatistics and the use of computers in biostatistics activities.

(1) Students in the fields of biomedical and public health are not properly trained in statistics, which results in the lack of use of statistics in these areas.

(2) Biomedical facilities and public health organizations have relatively small computers which are mostly occupied by general administration works. Hence, it is difficult to share the computers for statistical research and data analysis.

(3) It seems that medical doctors and staffs of public health organizations begin to recognize the significance of statistics in their works. However, since they do not know how to handle computers and statistical softwares, they are not active in using computers and statistics.

6. Suggestions to Improve the Use of Computers for Statistical Activities

The current status on the use of computers in statistical activities for several fields(education, industry, government and biomedical areas) have been reviewed and some problems and difficulties are listed. To boost the use of computers for statistical activities, I would like to suggest some general guidelines. I believe that these guidelines are also applicable to most developing countries to overcome the similar difficulties.

(1) The most essential part is to make people understand the importance of statistics. This is perhaps the most important task for statisticians to any country. For this purpose, easy-to-read statistical articles in newspapers, magazines or periodicals should appear as often as possible, and some interesting introductory statistics-story books should be published

for the general readers.

(2) Computational statistics and statistical packages should be taught at statistical-related departments in universities. Also special courses for statistical softwares should be offered for non-statistics-majored students. Hence, any student or any person who is interested in statistics softwares can have a chance to study them. Such special courses can be offered by university computer centers or statistical consulting groups.

(3) Any organization, whether it is government, university or research institute, should invest in computers, computer personnels and computer softwares, which is a profitable investment for the future. In developing countries, people do not create computer jobs for computers. Instead, big computers often create computer jobs for people.

(4) Enterprises, government organization and research institutes should employee professional statisticians for statistical activities such as sample design, experimental design, statistical quality control, empirical data analysis, etc.. There is some wide-spread misunderstanding that engineers can do industrial statistics, medical doctors can do biostatistics, economists can do economic statistics, and so on. Such misunderstanding should be corrected for proper application of statistics in every field.

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SUMMARY

This paper reviews, first of all, the current status on the use of computers for statistical activities in all sectors of Korea including educational sector, governmental sector, industrial sector, biomedical sector and so on. Secondly, some difficulties for the use of computers for statistical data analysis in developing countries are studied and elaborated. Finally, some suggestions to promote the use of computers for statistical activities in developing countries are presented.

résumé

Cet article se propose, d'abord, de mettre au point l'état actuel des emplois en Corée de l'ordinateur pour les activités statistiques dans tous les domaines : le secteur d'enseignement, le secteur gouvernemental, le secteur bio-médical, etc. En second lieu, nous avons étudié les difficultés que présente l'emploi de l'ordinateur dans l'analyse des donnés statistiques. Enfin, nous avons essaye de suggérer quelques moyens de promouvoir l;emploi de l'ordinateur en vue du de'veloppement des pays.

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ON THE DEVELOPMENT OF TIMSAC PROGRAM PACKAGES

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Introduction

This paper gives an outline of the series of TIMSAC program packages developed at the Institute of Statistical Mathematics in the past 15 years. Characteristics of each package and earlier examples of application will be briefly described and implications of the experience of the development of these packages on the future development of statistical softwares will also be discussed.

2. The TIMSAC packages

The series of TIMSAC (Time Series Analysis and Control) program packages is composed of original TIMSAC, or TIMSAC-71, TIMSAC-74, TIMSAC-78 and TIMSAC-84. The hyphenated numbers denote the year of completion of each package. Each program package is characterized by the use of particular time series models or computational procedures and reflects various phases of the progress of the research on time series at the Institute of Statistical Mathematics. All the programs are written in IBM type Fortran.

The original TIMSAC, or TIMSAC-71, published in Akaike and Nakagawa (1972), contains programs for the spectrum analyses by the conventional windowing procedure and by the autoregressive (AR) model fitting. It also contains programs for the analysis and control of a feedback system by the multivariate autoregressive model fitting.

TIMSAC-74 (Akaike, Arahata and Ozaki, 1975 and 1976) is characterized by the inclusion of procedures for the fitting of autoregressive moving average (ARMA) models. It also contains a program for the analysis of non-stationary time series.

In TIMSAC-78 (Akaike, Kitagawa, Arahata and Tada, 1979) the Householder transformation is systematically used for the fitting of AR models to avoid the computation of autocovariance sequences. Programs for the computation of exact likelihoods of AR and ARMA models are also included.

TIMSAC-84 (Akaike, Ozaki, Ishiguro, Kitagawa, Ogata, Tamura, Katsura, and Tamura 1985) shows a significant departure of the basic modeling from the preceding packages. It contains several programs for the analysis of nonstationary time series by Bayesian type models. Also it contains basic programs for the analysis of point processes and extends the domain of the application of the package from ordinary time series to point processes.

In these packages each program is provided with instructions for its use in the form of comments. TIMSAC-78 and TIMSAC-84 are published with numerical examples to help users in implementing the programs.The list of all the programs in the TIMSAC series is included in Appendix.

3. Significant characteristics of the packages

The most significant general characteristics of the TIMSAC series is the systematic use of the information criterion AIC or ABIC, the Bayesian extension of AIC, for the evaluation and selection of time series and point process models. The model selection in TIMSAC-71 was realized by the use of the final prediction error (FPE) criterion which was later extended to the more general criterion AIC. The model selection is realized by simply choosing a model with minimum FPE or

AIC.

TIMSAC-71 is characterized by the systematic use of multivariate AR models for the analysis and control of feedback systems. The AR modeling procedure in the time domain is supplemented by the spectral analysis procedure in the frequency domain that helps the interpretation of the time domain modeling. The optimal controller design procedure through the AR modeling represents a unique contribution of the time series approach to the control problem.

Certainly there is a limitation in the modeling approach due to the choice of the basic family of models. TIMSAC-74 extended the basic model from AR to ARMA. The most serious concern in this case was with the ARMA modeling of vector time series. The problem was the identifiability, or uniqueness, of the representation and a solution was obtained by introducting a state space or Markovian representation (Akaike, 1974).

TIMSAC-74 contains a program, CANOCA, for the preliminary analysis of the structure of the state vector by the canonical correlation analysis of the time series. The program MARKOV fits a Markovian representation with a specified structure of the state vector that is determined by CANOCA or its modification. To the present author's knowledge this was the first procedure of multivariate ARMA model fitting that explicitly took the identifiability problem into account.

The model fitting procedures adopted in TIMSAC-71 and 74 are based on approximate likelihoods that are defined through the sample autocovariance sequences. TIMSAC-78 bases its procedures mainly on the Householder transformation of the matrix composed of the column vectors defined by successive shifting of the origin of time of the original sequence of observations. By this approach the computation of sample autocovariances is avoided. The approach allows easy adjustment of the lag length of the autoregression for each component of the observation vector.

Although computational accuracy and flexibility of the procedure is increased by this approach the resulting procedure is conditional on the first few observations used to define the initial state of the series. The exact likelihood computation programs for stationary AR and ARMA models included in the package TIMSAC-78 eliminate this problem by introducing the distributions of the initial states explicitly. In particular, the program XSARMA that computes the exact likelihood of a stationary ARMA model contains a subroutine that efficiently compute the covariance matrix of the state vector of a scalar stationary ARMA model by the procedure given in Akaike (1978a).

TIMSAC-78 contains also a program for the analysis of time series with slowly changing spectrum. The program is based on a Bayesian type modeling obtained by defining the likelihood of a model by exp(-0.5AIC), where AIC is by definition

$$\text{AIC} = (-2) \log \text{maximum likelihood} + 2\ (\text{number of parameters}) \quad ,$$

where log denotes a natural logarithm. The use of this type of modeling is discussed in Akaike (1978b, 1979).

TIMSAC-84 is mainly characterized by the use of Bayesian and point process models. The (quasi) Bayesian models provide procedures for the analysis of nonstationarities such as seasonal variations and changing spectrum. The programs for the point process analysis contain those for the trend and cycle analysis of the intensity function of a Poisson process and the analysis of a linearly self-exciting point process with trend and linear input. With other standard programs for the analysis of point processes, such as for the simulation, graphics and conventional direct Fourier analysis, this collection of point process analysis programs forms a unique contribution that extends the coverage of the application of the TIMSAC series.

The package also contains programs for the fitting of particular nonlinear time series models and a program that is a unification of the analysis and control programs given in the original TIMSAC. One characteristic of this latter program is that it realizes a procedure for the analysis of

the behavior of a historical time series data through the simulation of the expected behavior of the time series when the original generating mechanism is modified by the implementation of an optimal controller.

4. Earlier examples of practical applications

Many of the programs within the TIMSAC program packages were developed by responding to practical needs of applications. In particular, the main part of TIMSAC-71 was developed to provide a procedure for the analysis and control of the cement rotary kiln process. The test with a real process provided an assurance of the success of application of the TIMSAC package in other fields. The package established the use of the multivariate autoregressive model as a basic model for the analysis and control of a feedback system operating under a stochastic environment.

The first example of application was to the analysis and control of a cement rotary kiln process and successful result was reported in Ootomo, Nakagawa and Akaike (1972). The same procedure was applied to the implementation of a ship's autopilot by Ohtsu, Horigome and Kitagawa (1979). This result clearly demonstrated the superiority of this new type of control to that by the conventional autopilot. The procedure was also applied to the control of thermal electric power plants. This produced a first example of practical use of modern optimal control theory in this area and was reported in Nakamura and Akaike (1982).

The technique of the feedback system analysis by TIMSAC-71 package also found important applications. Besides the applications required in the preliminary analyses for the implementation of the above stated controls the technique of the feedback system analysis was applied to the analyses of noisy system as found in experimental atomic power plants (Fukunishi, 1977), economic data (Oritani, 1979) multi-channel record of brain wave (Akaike,1981), and clinical medical record (Wada, Akaike and Kato, 1986). These applications provided quantitative evidences on the behaviors of the related systems which had hitherto been vaguely guessed by researchers in each subject area.

The program for the analysis of locally stationary process included in TIMSAC-74 has been adapted to generate a procedure for the automatic detection of the arrival time of an earthquake (Yokota, Zhou, Mizoue and Nakamura, 1981).

The application of the Bayesian seasonal adjustment program BAYSEA, included in TIMSAC-84, to the U. S. economic data revealed limitations of the Census Method X-11 procedure (Akaike and Ishiguro,1983). Its extension BAYTAP-G for the analysis of earth tide, also included in TIMSAC-84, is now routinely used at the International Latitude Observatory, Mizusawa, Japan, for the analysis of geophysical records related to the deformation of the earth (Ishiguro, 1981).

The programs for the point process analysis in TIMSAC-84 have been extensively applied to the analysis of seismic records by Y. Ogata who developed these programs. One significant application of the program LINLIN is to the analysis of mutual dependence between earthquakes in two different areas of Japan (Ogata, Akaike and Katsura, 1982). The result established the existence of a clear one-sided influence from earth-quakes in the Hida area to those in the Kwanto area. It is expected that the programs will find increasing applications in the earthquake and neural information analyses.

For further publications related to some of the programs in TIMSAC-84 readers are referred to the additional references included in Appendix.

It may be of interest to note here that after 15 years since the introduction of the original TIMSAC an adaptaion of the optimal steam temperature control of super critical thermal power plants based on the multivariate AR modeling is now being contemplated in the U.S. for the control of ultra super critical thermal power plants. This provides an example which demonstrates the importance of time series analysis software as a key to the realization of an industrial application of

modern optimal control theory.

5. Implications of the experience with TIMSAC packages for the development of statistical softwares

The leading idea for the development of TIMSAC program packages was to produce new models and procedures of time series analysis and provide a proof of feasibility for each procedure in the form of a computer program. The performance of each program has been tested by its application to real or simulated data. Since the main objective was to provide proofs of feasibilities attention was not fully paid to the user friendliness of programs. It was assumed that this aspect would be taken care of by knowledgeable users who would wish to adapt the programs for their own use.

One particular example of adaptation can be seen in the SILTAC (Self-Instructive, Learning and Turtorial System for Statistical Analysis and Control of Dynamic Systems) system, developed by the System Sogo Kaihatsu Co., Tokyo, which systematically teaches the user of some of the procedures described in TIMSAC in conversational mode on a micro-computer. There remains much to be done in this direction of developing expert systems for time series analysis.

It can fairly be safe to say that any computer program package for time series model fitting cannot be recommended for routine use in time series analysis unless it is equipped with some procedure for the evaluation of the relative goodness of each model. In particular, the difficulty in deciding on the final choice of a model becomes extremely significant with high dimensional vector time series. In our original experience of fitting multivariate AR models to cement kiln process data we had to fit models to the records of 7-dimensional time series of cement kilns under various operating conditions and it became quickly clear that the selection of orders for 7-dimensional AR models was practically impossible without depending on some objectively defined criterion. This lead us to the introduction of the FPE criterion in the original TIMSAC.

Some statisticians consider the model selection procedure by minimizing FPE or AIC as "mechanistic". This represents the lack of experience of handling large number of data sets in a real life situation. The use of artificial intelligence for statistical computing is a popular subject at present. We feel that the model selection by the minimum AIC procedure is an example of successful realization of artificial intelligence that supersedes the activity of ordinary human intelligence in certain situations.

One university professor once jokingly complained about the "automatic" procedure of power spectrum estimation by the minimum AIC procedure of AR model fitting, describing it as a threat to his profession. The complaint meant that before the introduction of the procedure anyone who could properly use the windowing procedure for spectrum estimation was considered to be an expert of time series analysis, while the "mechanistic" procedure eliminated the necessity of such expert. Actually, results obtained by this procedure were often better than those obtained by the windowing procedure in some applications.

During the process of implementing the optimal control of cement kilns results produced by TIMSAC programs clarified some of the limitations of human operators who were the experts of the kiln operation. This suggests possible limitation of the expert system approach to statistical data analysis when it is not supported by any "super intelligent" statistical software.

Statistical procedures are designed to provide proper matching between data from the outside world and human intelligence and aid the development of proper understanding by a human being. Thus a statistical software must be based on a statistical procedure that extends certain aspect of human intelligence to claim its unique existence. Our experience in the development of the TIMSAC packages suggests that the development of proper families of statistical models and criteria for the evaluation of estimated models provides one possibility.

The development of new models will mainly be realized through the contact with real problems and this will also provide a proper framework for the discussion of the choice of model

evaluation criteria.

We may thus conclude that the establishment of a proper system that realizes a continuous contact of statisticians with real problems will allow continual development of useful statistical softwares. This was the case with the development of the TIMSAC program packages.

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APPENDIX

The programs in the TIMSAC program packages are listed below.

TIMSAC-71

AUTCOR	(Autocovariance function computation (uni-variate); direct method)
MULCOR	(Crosscovariance function computation (multi-variate); direct method)
FFTCOR	(Crosscovariance function computation (bi-variate); FFT method)
AUSPEC	(Power spectrum computation; uni-variate)
MULSPE	(Cross spectrum computation; multi-variate)
SGLFRE	(Frequency response function computation; single-input)
MULFRE	(Frequency response function computation; multi-input)
FPEAUT	(FPE Computation for uni-variate autoregressive model)
FPEC	(FPEC Computation for control system model or multi-variate autoregressive model)
MULNOS	(Relative power contribution computation)
DECONV	(Inpulse response computation)
RASPEC	(Rational spectrum cumputation; uni-variate)
MULRSP	(Rational spectrum computation; multi-variate)
OPTSIM	(Optimal control simulation)
WNOISE	(White noise simulation)

TIMSAC-74

PART-1

CANARM	(Canonical correlation analysis of scalar time series)

AUTARM	(Automatic AR-MA model fitting: scalar case)
COVGEN	(Covariance generation from gain function)
CANOCA	(Canonical correlation analysis of vector time series)
MARKOV	(Maximum likelihood computation of Markovian model)

PART-2

PRDCTR	(Prediction by AR-MA model)
SIMCON	(Optimum controller design and simulation)
NONST	(Non-stationary power spectrum analysis)
PWDPLY	(Power spectrum display)
FRDPLY	(Frequency response function display)
THIRMO	(Third order moment computation)
BISPEC	(Bi-spectrum computation)

TIMSAC-78

UNIMAR	(Univariate case of minimum AIC method of AR model fitting)
UNIBAR	(Univariate case of Bayesian method of AR model fitting)
BSUBST	(Bayesian type all subset analysis of time series by a model linear in parameters)
MULMAR	(Multivariate case of minimum AIC method of AR model fitting)
MULBAR	(Multivariate case of Bayesian method of AR model fitting)
PERARS	(Periodic autoregression for a scalar time series)
MLOCAR	(Minimum AIC method of locally stationary AR model fitting; scalar case)
BLOCAR	(Bayesian method of locally stationary AR model fitting; scalar case)
MLOMAR	(Minimum AIC method of locally stationary multivariate AR model fitting)
BLOMAR	(Bayesian method of locally stationary multivariate AR model fitting)
NADCON	(Noise adaptive controller)
EXSAR	(Exact maximum likelihood method of scalar AR model fitting)
XSARMA	(Exact maximum likelihood method of scalar AR-MA model fitting)

TIMSAC-84

PART 1

BAYSEA	(Bayesian seasonal adjustment)
BAYTAP-G	(Bayesian tidal data analysis)
DECOMP	(Time series decomposition into components by the Bayesian approach)
LOCCAR	(Locally constant AR model)
TVCAR	(Time varying coefficient AR model)
NONSPA	(Nonstationary spectrum analysis by minimum ABIC procedure)

PART-2

MULCON	(Multiple time series analysis by simulated prediction and control)
SNDE	(Stochastic nonlinear differential equation model)
ADAR	(Amplitude dependent AR model)
EPTREN	(Exponential polynomial or Fourier series modeling of trend and cycle of Poisson intensity)
LINLIN	(Linearly self-exciting process with trend and linear input)
PGRAPH	(Graphic point process analysis)
LINSIM	(Simulation of the point process identified by LINLIN)
SIMBVH	(Simulation of a bi-variate Hawkes point process)
PTSPEC	(Point process spectrum by direct Fourier transform)

PUBLICATIONS RELATED TO TIMSAC-84

BAYTAP-G

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SUMMARY

The program packages of the TIMSAC series have been developped at the Institute of Statistical Mathematics since 1971. In this paper the construction of the packages is explained and early examples of their applications are presented. The paper concludes with the discussion of implications of the experience of the development of these packages on the future development of statistical softwares in general.

RÉSUMÉ

Les logiciels des séries TIMSAC ont été développés à l'Institut des Mathématiques Statistiques depuis 1971. Ce rapport expose la construction des logiciels et présente les premiers exemples des leurs applications. La conclusion traite des implications de l'expérience du développement de ces logiciels sur le développement futur des logiciels statistiques en général.

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Experience with ADABAS at the Australian Bureau of Statistics

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ABSTRACT

ADABAS is a well known commercial data base management system. The Australian Bureau of Statistics (ABS) has had ADABAS for some six years and has gained considerable experience with it. This paper discusses the ways in which ADABAS is used for the various types of data within the ABS - unit record data, informant registers, meta data, administrative and control data and aggregated data. It highlights a number of special techniques which the ABS has employed for effective use of ADABAS and also the cases where use of ADABAS has not been found appropriate.

INTRODUCTION

In 1980, as part of a major re-equipment with a FACOM (IBM compatible) mainframe, the ABS acquired ADABAS as its data base management system. Over the ensuing 6 years, almost all of the applications that were previously running on a variety of Control Data machines have been transferred to or redeveloped on the FACOM equipment with a number of new applications being developed as well. In many instances systems that had been separate in the Control Data environment were integrated when they were redeveloped for the FACOM environment.

In the course of each development or redevelopment ADABAS was considered as one of the possible ways of storing and managing the data. The alternatives were VSAM, SAS and ordinary sequential files (QSAM). In many cases ADABAS was chosen as the data storage method and it is now in widespread use in ABS applications. An indication of the extent of its use is that the ADABAS nucleus consumes around 30% of available cpu resources (eg 155 of an available 540 cpu hours in November 1986).

There were two main reasons why project leaders chose to use ADABAS as their data store. The first, which was particularly significant where systems were being integrated, was the perceived need for facilities provided only by a DBMS such as support for multiple concurrent access to data, support for system-specific 'userviews' for the various applications running against the data, transaction control facilities, and centralised backup and recovery facilities. The second was the attraction of being able to use NATURAL, the self-contained 'Fourth Genera-

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tion Language' associated with ADABAS for ad hoc access and, in some cases, for program development. There were some countervailing considerations. Access to data in ADABAS was generally more expensive in machine terms than access to data stored in QSAM and VSAM. And while accessing data in ADABAS from NATURAL was straightforward, NATURAL was not suitable for processing of a complex or mathematical nature and access to ADABAS from PL/I and COBOL was neither straightforward nor flexible. In the main, ADABAS was preferred to non-DBMS approaches but compromises were made to minimise perceived costs and difficulties. With the benefit of hindsight these compromises appear not to have been, in all cases, the wisest choice.

In this paper we shall discuss the way we use ADABAS for different kinds of data, where we have found it more or less useful, and the lessons we have learned that may be of benefit to others. The paper begins with a brief overview of ADABAS functionality and then goes on to examine the use of ADABAS for the various types of data in the ABS -

- unit record data
- informant registers
- meta data
- administrative and control data
- aggregated data

ADABAS : BRIEF DESCRIPTION

Each copy of the ADABAS software manages what is termed an ADABAS data base. An ADABAS data base is a collection of files, each of which contains up to 16.7 million data records. In turn, each record is made up of values for a number of fields. Figure 1 illustrates the relationship of files, records and fields.

At the time of writing the ABS had over 500 ADABAS files, arranged into 6 data bases, and serving about 60 applications. The overall amount of disk space used by these data bases was approximately 12.8 Gbytes (12,800,000,000 bytes).

ADABAS has support for a range of data types in its data fields - character, unpacked decimal, packed decimal, fixed point and binary. It also has comprehensive support for data compression. The default compression option trims leading zeros from numeric fields and trailing

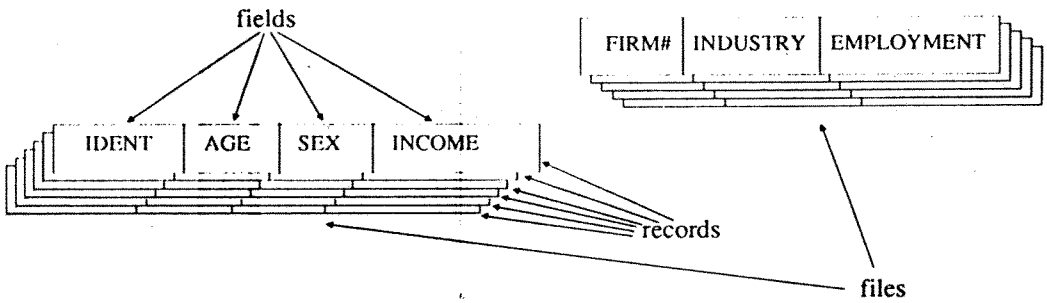

Figure 1 : An ADABAS Data Base containing 2 Files*

blanks from character fields. In addition to this the NULL SUPPRESS compression option allows up to 63 adjacent null-value fields to be stored in a single byte.

Data base management systems generally provide for direct access to data records on the basis of the values which those records contain in specified key fields. In the case of ADABAS, these key fields are referred to as descriptors. ADABAS maintains an inverted-list style index for each descriptor field. These inverted lists are held for each ADABAS data base in a disk file known as the ASSOCIATOR for that data base. Essentially the ASSOCIATOR is an index with pointers into the data records which are held on the DATA STORAGE disk file.

Among data base management systems on the market today there is a strong trend towards support for the relational model of data. With this model, all data can be thought of as being arranged in simple two dimensional tables. Such tables can be stored in what are sometimes known as "flat" files. ADABAS is often reputed to be a commercially viable means of implementing the relational model. It certainly promotes the relational notion of a data base being a collection of separate flat files. With ADABAS, as with a relational dbms, it is not necessary to have a stored, predefined access path to link between files:- all linkage is logical on the basis of values in fields which are common to the files being linked. On the other hand, ADABAS does incorporate some distinctly non-relational features. Notable amongst these are periodic groups (PEs) which allow a group of fields to recur within a record and multiple valued fields (MUs) which allow a field to have up to 191 values stored in it.

In order to facilitate involvement by non programmers and to achieve ease of use, the ABS designs its data bases along relational model lines. However in almost all cases we have, at implementation time, made use of the non-relational features of ADABAS to reduce the number of physical files and achieve acceptable efficiency in machine-resource terms. This is discussed in more detail in the next section of the paper.

STATISTICAL UNIT RECORD DATA

This data is the raw material for processing in a statistical agency. In the main, the unit records are captured by data entry of completed returns and as a by-product of administrative systems from other areas of government. ADABAS is used extensively for statistical unit record data in the ABS and only a few of the more interesting applications are mentioned here.

For handling some of its unit record data holdings the ABS has exploited a number of features of ADABAS to great advantage. Examples are the use of null suppression by the Household Surveys System and the use of multiple valued fields by the Agricultural Statistics System.

The Household Surveys System is the processing system for the Monthly Population Survey. This survey has a major regular component on employment and unemployment but is also used as the vehicle for a large variety of 'supplementary' surveys. This supplementary component varies greatly from month to month and even within the one month from state to state. Some of the supplementary surveys are one-off while others recur regularly or irregularly. Thus the processing system must be flexible enough to cope with this high degree of variability and yet coherent enough to allow easy access to this major holding of statistical data. The system is built around an ADABAS file created with a large number of fields having the NULL SUPPRESS compression option. The fields are available as a pool, to be assigned particular roles by their inclusion in a userview. In this way a record type can be "tailor made" for each cycle

of a survey with details being held in the data dictionary. ADABAS null suppression ensures that fields which are not active in a particular month use minimal space in DATA STORAGE and none at all in the ASSOCIATOR. This approach is referred to in the ABS as the "underlying view" technique (the underlying view being the pool of null-suppressed fields).

The Agricultural Statistics System has a requirement for recording information on commodities produced by individual establishments in the agricultural sector. Some 2000 different commodities are recognised and quantity and value information for each can be reported. On average each establishment reports 30 commodities, although many report more than 100 and some isolated cases more than 200. The logical data model involved is shown as Figure 2.

The developers of this system chose to use a single ADABAS file to hold both establishment and associated commodity data. The commodity codes and quantity figures were strung together and stored as values of a multiple valued field. Overflow records were used for those establishments reporting more than 191 commodities (191 is the limit on the number of occurrences of an MU field). At the price of some complication in the accessing logic (required to reconstitute the commodity data) this design minimized the number of ADABAS calls and disk storage space required for the Agricultural Statistics System unit records.

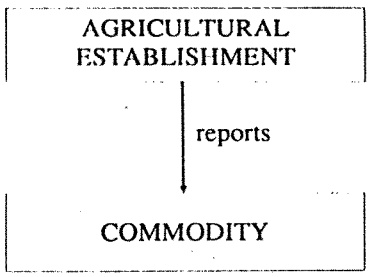

Figure 2 : Agricultural Statistics Data Model

Not all unit record collections in the ABS are handled by ADABAS. The quinquennial Population Census is an example of an application where the unit records are managed by VSAM, rather than ADABAS. The basic reasons for not choosing ADABAS in this case were the large number of unit records involved (approaching 20 million overall) and the lack of perceived need for online access to individual unit records.

The Population Census application does use ADABAS to hold summary data at the collectors district level. In this way the application blends the flexibility of ADABAS for descriptor retrievals with the efficiency of VSAM for large scale data volumes.

In some cases the decision to use ADABAS to manage the unit record holdings is now seen as something of an overkill. For instance the Foreign Trade application chose ADABAS because of an anticipated user requirement for revising an individual statistical return up to 3 years after it originally entered the system. Resource pressures (both human and machine) have meant that this ambitious update strategy was never implemented in Foreign Trade processing. Given the large numbers of Foreign Trade unit records, a VSAM-based approach may well have been more appropriate.

A general characteristic of statistical unit record data is that it is subject to two quite different kinds of access activity in the course of a collection cycle. There is an initial process of loading, editing and amending, wherein it is advantageous to be able to access directly particular unit records on the basis of fields such as LOCATION, EDIT-STATUS and some unique identifier. When this process is substantially complete, the unit records are input to the tabulation process. Typically tabulation requires sequential access to all or large segments of the unit records for a collection cycle.

In ABS experience, ADABAS is well suited to storage of unit records during the loading/edit/amend part of the collection cycle. The exceptions are when there are very large numbers of unit records (say over 10 million) and where there is a very small requirement for update of individual records. However experience in many ABS applications has shown that tabulating of data held on ADABAS is quite expensive. Prior to the commencement of tabulation processing, several applications now take a "snapshot" of their ADABAS unit records and store that snapshot on a QSAM file. The QSAM file is subsequently fed through Table Producing Language (TPL).

To some extent, the expense of ADABAS-based tabulation is due to the "general purpose" way in which the data is accessed by TPL. TPL contains record and field selection facilities of its own but is unable to make direct use of the selection facilities provided by ADABAS. The ABS has built interfaces that allow TPL to access 'userviews' from ADABAS data but these provide very little flexibility. Generally complete records (containing all or most of the fields) are extracted from ADABAS and passed to TPL. Often most of the ADABAS file is processed. This is inherently expensive. It incurs all the costs of DBMS access but avoids almost all the benefits. It would be possible to build an efficient tabulation system in conjunction with ADABAS but to add a suitable interface to TPL has not proved practical.

Another strategy which has proven effective for reducing the cost of ADABAS-based tabulation in the ABS is the use of the 'P' option. This option arranges for several records to be returned in response to a single call to ADABAS. In a large tabulation run this significantly reduces the number of ADABAS calls issued, which in turn leads to appreciable cpu savings.

REGISTER DATA

The term "Register" refers to the lists of businesses and other potential respondents which are maintained to assist in the conduct of statistical collections. The nature of these lists and of their access and update patterns has much in common with commercial data base applications. Registers need to be updated constantly and they are frequently accessed simultaneously by several applications or users. Online availability is a distinct advantage. Perhaps not surprisingly, ADABAS is used to hold most register data at the ABS.

The Integrated Register Information System (IRIS) is the largest register application in the ABS. This register contains a variety of details for every business unit in Australia. The holdings are time stamped, so that historical as well as current details may be held. At the time of writing this register contained over a million data records. Figure 3 shows the rather complex logical data model for this register.

Mindful of the large number of unit records and the high levels of usage of this register data, the IRIS system developers sought to optimize their ADABAS design for I/O performance. They chose to implement their logical

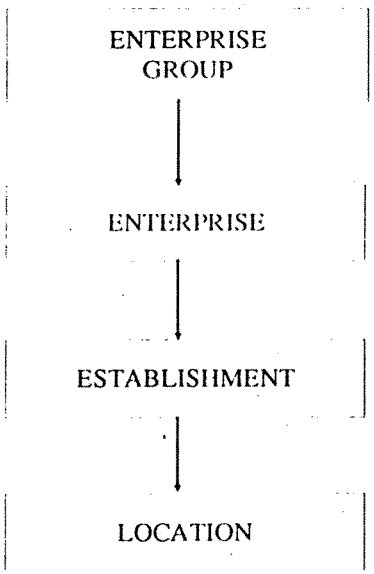

Figure 3 : Logical Data Model for ABS Integrated Register

data model as one physical ADABAS file, wherein information for most of the smaller single establishment businesses could be held in one physical ADABAS record. More complex business units are held in multiple physical ADABAS records.

This strategy has not been an unqualified success. IRIS is itself inherently large and complex and the extra complexity imposed by the move away from a relational design added significantly to the difficulties of development. The resulting system suffered from performance and usability problems and options for post-implementation tuning were also limited by the design. Statistics Canada are currently in the process of building a very similar system for their business register, also using ADABAS but with a full relational design and extensive use of NATURAL. It will be interesting and instructive to compare their experience in a few years time with that of the ABS.

META DATA

As the term "meta" suggests, this is data about data - essentially descriptions of data content and structure. Holding these descriptions together in a common meta data store makes it easier for users to determine whether the data they need is available and also can reduce the costs of maintaining applications systems in the event of changes in the way the data is stored.

In the ABS one reason why ADABAS is used extensively for meta data is the high level of concurrent access to such data - many systems access the dictionary both at compilation time and at run time. An important practical reason is that ADABAS itself requires meta data descriptions of its own files and fields to be stored in ADABAS files. These files together form the ADABAS Data Dictionary and this dictionary makes provision for user extensions.

The ABS has extended the ADABAS Data Dictionary by incorporating additional files, fields and record types. These are used to hold additional types of meta data which are useful for processing in a statistical agency environment. Examples are structure details for non-ADABAS files (QSAM or VSAM), an extra file for holding labels (classifications or "descriptors") used in tabulation reporting, and an extra record type for storing descriptions of statistical processes. The Data Dictionary has a central role in ABS processing. Not only do ABS-built packages and systems make active use of this data dictionary but interfaces have been added to purchased packages such as TPL while preprocessors have been built to incorporate record descriptions from the dictionary into PL/I and COBOL programs.

ABS experience has been that ADABAS provides an effective environment for the development of Data Dictionary facilities. It is less clear that the decision to combine the ABS dictionary with the ADABAS dictionary was a wise one. While there is certainly overlap between the coverage of the two dictionaries the joint dictionary has a large number of fields and a very large number of descriptors and performance is affected. Moreover ADABAS has recently released a new dictionary (called PREDICT) and the ABS is now faced with some redevelopment activity.

If the potential benefits of centralizing meta data in a common store (such as the ABS Data Dictionary) are to be realized then all packages and programs should use the meta data. They should refer to the Data Dictionary whenever they require details about the data which they are processing. Record structures, for instance, should be obtained from the Data Dictionary rather than hard coded into PL/I or COBOL programs. Similarly labels for a table report should be ob-

tained from the Dictionary rather than hard coded in a TPL request. The ABS has followed this path but one of the consequences is that the Data Dictionary becomes crucial to all processing. As an application the Data Dictionary is very complex, most accesses are random and multi-key, and even though the access load is relatively small performance is a problem. The ABS has devoted more effort to improving dictionary performance (with some success) than to any other data base application.

ADMINISTRATIVE AND CONTROL DATA

Any large organization requires considerable quantities of data to support the operation of its administrative and financial systems. In a commercial organization this would typically include data on personnel, accounts payable, accounts receivable and stock inventories. In general terms this data is record-oriented, of moderate rather than large volume and accessed via a variety of keys, frequently on line and by several users simultaneously. Given the commercial background of ADABAS it is perhaps not surprising that ADABAS has been found well suited for handling administrative and control data in the ABS.

The ABS personnel system, NOMAD, is based on three ADABAS files. The system itself was developed in a very brief timeframe using NATURAL. The ADABAS files are used to record details of individual staff members, positions in the organization and a history of occupancy of those positions.

The ABS keeps track of distribution and charging for its publications by means of the PML (Publication Mailing List) system. PML is also written in NATURAL and its data model is shown in Figure 4.

As the data model shows, the system records details of subscribers to ABS publications. There is an interest profile held for each subscriber to assist in determining the market for a new publication. Several subscribers (eg in the one organization) may charge their purchases to the same account. There is a many-to-many relationship between subscribers and publications (each publication has many subscribers; an individual can subscribe to more than one publication). This relationship is implemented along relational model lines in the SUBSCRIPTION record type.

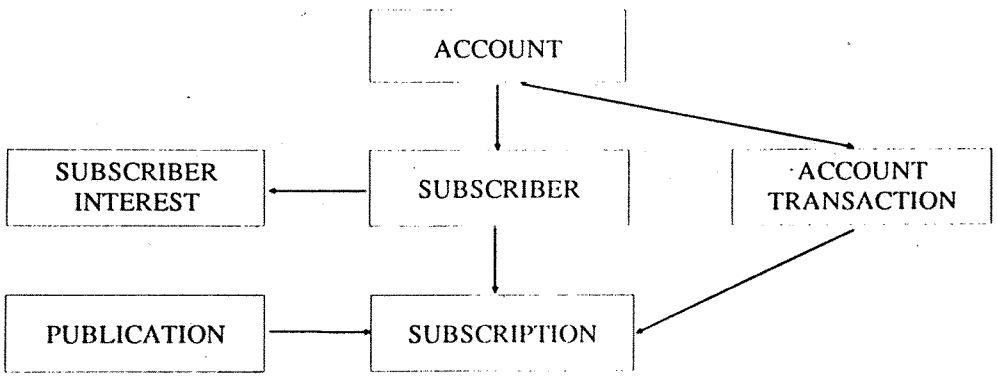

Figure 4 : Data Model for Publication Mailing List System

The ABS has also made extensive use of ADABAS for managing the data stores required for supporting the operation of its various applications systems. Typically each application has an interactive interface for submitting and monitoring the progress of batch jobs. These interfaces are generally written in NATURAL, because of the easy screen-building facilities offered by NATURAL, and also because ADABAS files are easily accessed via NATURAL. A good example of this type of data is the SESSION-CONTROL file used in the DACC (Dispatch and Collection Control) system. Update transactions (eg mark in a form, change respondent address) are captured during an interactive terminal session, and stored in this file pending their application in a batch job. ADABAS is well suited for such files because of its support for multiple concurrent update and its built-in facilities to reuse freed space.

AGGREGATED DATA

This data consists of frequency counts and sums of values in observation fields (eg INCOME) of unit records which have like characteristics. These counts and sums are generated by the process of cross tabulating the unit records. Each cross tabulation is defined by a combination of control fields (eg AGE, SEX, MARITAL-STATUS).

There is no doubt that an ADABAS file could be used to store and manage the data in any such cross tabulation. The unique key for the ADABAS file would be the combination of control fields which defined the cross tabulation. Each record would contain the counts and tallies relating to a particular set of values for these control fields.

However ADABAS is not well suited as a general purpose store for aggregate data. To understand why one has only to realise that there are a great many different cross tabulations produced by any statistical agency like the ABS. Each of these cross tabulations would have to be stored either as a separate ADABAS file (which would require a ridiculous number of files and consequently copies of ADABAS) or in some "omnibus" ADABAS file (which would require an inordinately large number of descriptors to hold the control fields). Essentially it is the enormous variety of control field key combinations which makes ADABAS infeasible as a general purpose aggregate data store.

There are, however, some forms of aggregated data for which this variety of key fields is not a problem. One that has already been mentioned is the summary data at collectors district level for the Population Census which the ABS does hold in ADABAS. Another is time series data, each record of which has a single unique key (SERIES-IDENTIFIER). Each time series data record contains a number of observation values and these are normally all required to be retrieved together.

This single key nature of time series data means that ADABAS would be a feasible way of storing a time series data base. However the current ABS Time Series System, INFOS, is implemented using VSAM. The reason for this is largely historical - INFOS was developed originally using VSAM by the New Zealand Department of Statistics. However the ABS has encountered a number of problems in using INFOS that all essentially arise because VSAM does not provide the support facilities normally provided by a DBMS. Currently we are reviewing development plans for INFOS with a move from VSAM to ADABAS for data storage being one of the options under consideration.

SUMMARY

The ABS has made extensive use of ADABAS in its processing systems. In the main we have found it a satisfactory tool though it is more suitable in some areas than in others. It is particularly suitable for administrative and register applications but also works well with most statistical unit record holdings. It is well suited to the support of an active data dictionary (although the wisdom of our integration of our dictionary with the ADABAS dictionary is less well established). In the area of aggregated data we frequently extract sequential subsets from the data base before aggregation although this is largely because of limitations in the interface between the tabulation package and ADABAS.

As noted in the body of the paper the ABS has made extensive use of the non-relational features supported by ADABAS. In some cases this was done because it fitted the nature of the application but in many cases it was done mainly to reduce the number of calls to ADABAS and so reduce overheads. This has had the effect of complicating the application logic, in some cases very significantly. It has also meant that the process of tuning the application to improve performance has been made more difficult and in some cases it has meant that the application benefitted less from performance-improvement options introduced in later releases of ADABAS. It seems likely that we would have been better off had we kept our data base designs as relational as possible and relied on system-level actions to correct performance problems.

CENSUS EVALUATION: HOW GOOD IS THE INFORMATION THAT IS COLLECTED

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1. Introduction

For many countries population census methods involve self enumeration by informants, a large degree of proxy response where one household member completes the form on behalf of the whole household, and limits on the number and type of questions that can be asked. These methods are important if large volumes of data are to be collected and processed as quickly and cheaply as possible. However such methods may also be the causes of shortcomings in the quality of the data obtained.

When carrying out censuses of population many countries undertake evaluation programmes to estimate how well the population has been covered. Less common are studies to assess the quality of information that is collected. Studies carried out in recent censuses in England and Wales suggest that for some topics data quality could be a cause for major concern and for some users of the census the problems of quality may be more important than problems of coverage. The most recent study of this kind was a quality check of the 1981 Census.

2. Method

The method used was to conduct a post enumeration survey in which a sample of private households was interviewed as soon as practicable after the census by experienced and highly trained interviewers using detailed, in-depth questionnaires to elicit the 'true' answer for each census question. Those answers were then compared with the ones recorded on the census form for the same households. It could happen that where differences occurred the original census answer was correct and the survey answer incorrect. However such instances were largely eliminated from the survey data because the interviewer queried all differences with the informant to ascertain the true answer.

3. Results

The results presented here are in terms of gross errors: that is the proportion of cases where the census answer was different from that in the post enumeration survey. However for some variables these errors tend to cancel out in the net distributions.

Sixteen census variables were examined and the gross error rate was 8 per cent or more for five of them. For two of these the error rate was over 25 per cent. Moreover for some questions particular categories of answers had even higher rates and for other questions, even though the overall level of error was low (4 per cent or less for the other 11 variables), for some categories it was high.

The overall gross error rate was highest for the question on number of rooms in the household accommodation. Nearly 29 per cent of answers to this question proved to be wrong. For the question on economic activity, 8 per cent of the answers were in error. For employment status (ie employee or self-employed and sub-divisions of these), 10 per cent were misclassified. For occupation the error rate at the most detailed level was about 25 per cent and even at the much more compressed social class level, 13 per cent were in error. The gross error rate for the travel to work question was around 9 per cent.

For the question on household amenities (ie bath/shower and inside flush toilet) the overall gross error rate was low because the vast majority

of households answered, correctly, that they had both amenities. However for the important sub-groups of those lacking either of these amenities, the error rates were substantial at 17 per cent and 15 per cent respectively. Similarly the question on higher qualifications had an overall low error rate because the great majority of people reported, correctly, that they had no higher qualifications. But among those who did, the error rate was about 11 per cent.

4. Discussion

There were a variety of reasons why these errors occurred and different factors affected different questions. But generally most of the difficulties arose from having to use methods of data collection necessarily limited by the practicalities of census taking and not always adequate for the amount of detail sought. In particular the concepts underlying the answer categories of some questions required a degree of definition and explanation which the constraints of the census form made it almost impossible to provide and it was noticeable that in a number of cases a more compressed classification would have considerably reduced the gross error rate. (More compressed classification will often be more reliably achieved by compression at the processing stage than by reducing the answer categories on the census form.)

The 1981 Census form used in England and Wales was the shortest for 50 years. By most standards the questions might be considered uncontroversial and straightforward. On the evidence of the post enumeration survey however, the form used in future censuses may need to be redesigned so that the information which the census seeks is better fitted to that which the population is able to provide. This may involve more questions for some items and more easily understood questions and/or instructions for others. Or it may require that some of the classifications used will need to be reduced and simplified. If these measures prove impractical within the inherent limitations of census methodology, then either some topics will need to be accepted with expected high levels of gross error or the topics will need to be omitted altogether. However decisions about what to collect must take account of the needs for, and uses of, the data, as well as their accuracy.

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RESUME

Lors de recensements de nombreux pays mettent en oeuvre des programmes en vue d'évaluer dans quelle mesure la population a été analysée. Moine courantes sont les études destinées à juger la qualité des renseignements receuillis. Des études, menées récemment à l'occasion de recensements en Angleterre et au Pays de Galles, laissent à penser qu'il y a lieu de s'inquiéter de la qualité des données obtenues sur certains sugets, or, pour certains utilisateurs, la qualité des réponses est plus importante que le nombre de personnes interrogées. L'étude qualitative la plus récente date du Recensement de 1981.

7. 論文發表者 名單

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Rules of Procedure for Invited Papers Meetings

Each invited papers meeting will last three hours and basically consist of

(1) short introductory remarks by the organizer/chairperson,
(2) presentation of invited papers by their authors,
(3) prepared comments on the papers by invited discussants,
(4) general discussion of the papers,
(5) short replies by the authors.

The author should personally present his/her paper at the meeting for 25 to 30 minutes in one of the ISI conference languages, i.e., English or French. The chairperson can decide and change the order of presentation as well as the allocation of time for each presentation.

Normally the invited discussant should present his/her comments on the invited papers for 10 to 15 minutes in English or French.

A written summary of these comments must be submitted to the Secretariat of the National Organizing Committee (hereinafter referred to as the NOC Secretariat) one day in advance of the meeting. The summary must not exceed two pages typed with single spacing on the special forms provided by the NOC Secretariat.

The invited discussant should give a copy of the summary to the organizer/chairperson of the meeting and to the invited authors on the day of the meeting.

Each person who participates in discussion from the floor should submit a written summary of his/her comments bearing the name and country to the NOC Secretariat through the chairperson after the meeting. The summary should be typed or neatly written on the special forms provided by the NOC Secretariat.

The author should submit a summary of his/her reply to invited discussants and the floor to the NOC Secretariat through the chairperson after the meeting so that the summary of the whole discussion can be included in the Proceedings (the ISI Bulletin, Vol.52) to be issued after the 46th Session.

Authors who wish to use a slide projector during the meeting are requested to come to the Slide Receiving Desk (B1 lobby), which will open 30 minutes before the meeting, to set their slides and identify them by preview.

It is recommended that the organizer/chairperson call the invited authors and discussants to a preliminary meeting during the Session for the purpose of discussing the time schedule of the invited papers meeting, the rules of procedure, and technical matters. If such a call is not made, the authors and discussants should consult with the organizer/chairperson in the conference room 10 minutes before the meeting.

Three conference rooms are reserved for the invited papers meetings, which will operate simultaneously. Each conference room for invited papers meetings is equipped with a slide projector and two OHPs. The standard meeting schedule is from 9:00 to 12:00 and from 14:30 to 17:30 Monday through Friday, and from 9:00 to 12:00 on Saturday, normally with a break during the morning and afternoon sessions.

Simultaneous interpretation in English and French will be provided at each meeting and in Japanese at selected meetings.

Rules of Procedure for Contributed Papers Meetings

Each person who actually participates in the Session may present one contributed paper. The paper must not have been presented at any conference or published prior to the 46th Session.

Contributed papers must be presented at the Session in one of the following ways:

Traditional meeting. The programme is so designed that most papers on related subjects will be treated at the same meeting. Each paper will be orally presented for 10 to 15 minutes in one of the ISI conference languages, either English or French, and followed by a brief discussion.

The chairperson of each meeting can decide and change the order of presentation as well as the allocation of time for each presentation.

Those authors who wish to use a slide projector are requested to come to the Slide Receiving Desk (B1 lobby), which will open 30 minutes before the meeting, to set their slides and identify them by preview.

It is recommended that the organizer/chairperson call the authors to a preliminary meeting during the Session for the purpose of discussing the time schedule of the contributed papers meeting, the rules of procedure, and technical matters. If such a call is not made, the authors should consult with the organizer/chairperson in the conference room 10 minutes before the meeting.

Poster meeting. The author will display a summary with graphs, formulae or other visual aids on a reserved board. Participants will move freely and discuss papers individually with the authors.

By title. The paper will be listed in the official programme but not orally presented.

Four conference rooms are reserved for the contributed papers meetings, which operate simultaneously. The standard meeting schedule is from 9:00 to 12:00 and 14:30 to 17:30 Monday through Friday, and from 9:00 to 12:00 on Saturday, normally with a break

during the morning and afternoon sessions. Each conference room for contributed papers meetings is equipped with a slide projector and an OHP.

A space with a number of display boards installed is reserved for the poster meetings on 9 and 14 September from 9:00 to 12:00 and 14:30 to 17:30 in Room C (Ohtori-Nishi).

General Information

General Information Desk

A General Information Desk will operate in the B1 lobby during the Session to provide general and the Session related information, and answer all inquiries.

Registration

The Registration Desk will be open in Room F (Zuiun II and III), B1, from 13:00 to 18:00 on Monday, 7 September and from 9:00 to 18:00 on Tuesday, 8 September. Thereafter, registration will be accepted in the B1 lobby.

Name Badges

All participants and accompanying persons are requested to wear their name badges during the opening ceremony, welcoming reception, *sayonara* party, and while staying in the meeting area. The colours of the different badges are as follows:

Blue: Registered participants
Wine: Accompanying persons
Green: Staff members of the NOC Secreatriat and the Press
Brown: Members of the Honorary Committee and of the NOC, guests and others

Technical Equipment for Personal Use

The Function Corner will operate in Room C (Ohtori-Nishi) during the Session, except on the afternoon of 12 September and all day on 13 and 15 September. Participants may use typewriters, IBM PC/AT, IBM PC-5550 and BITNET. A Xerox is available at minimum charge.

Hospitality Corner

The Hospitality Corner will operate in Room C (Ohtori-Nishi) during the Session except on the afternoon of 12 September and all day on 13 and 15 September. Participants and accompanying persons may use this corner as a tea lounge. Members of the Ladies

Committee, consisting of wives of Japanese ISI members, and staff members of the NOC Secretariat will attend accompanying persons.

NOC Secretariat Office

The Secretariat office will open in Room E (Zuiun I), B1, from 8:00 to 19:00. Tel. 505-4201, 505-4202 (direct), 505-1111 ext. 5471

The telephone number for emergency calls will be shown in the first issue of the Daily Bulletin.

Daily Bulletin

The Daily Bulletin, providing official information from the ISI, its Sections and the NOC, including any programme changes, will be issued daily except Sunday and available at 8:00 at the Daily Bulletin and the General Information Desks, B1. (For details, please see the first issue of the Daily Bulletin.)

Allocation of Meeting Rooms

Participants wishing to arrange informal meetings should apply for room space to the NOC Secretariat.

Distribution or Display of Documents/Publications

Participants wishing to distribute or display documents personally should ask the Chairman of the Operation Committee (through the NOC Secretariat) for permission.

Request for Additional Copies of Documents

Participants wishing to get additional copies of documents may make such request to the NOC Secretariat. Copies will be provided at minimum charge so long as they are available.

Communication

Notice boards will be installed in the B1 lobby. Official notices from the ISI Permanent Office, the NOC Secretariat, the Local Programme Committee, organizers of scientific meetings, etc. will be posted on the boards.

The boards may also be used by participants for personal messages.

Snapshots

Commercial snapshots taken on various occasions during the Session will be exhibited in Room C (Ohtori-Nishi), B1. Participants can buy them at minimum cost.

Refreshments

Japanese green tea will be served during the morning break, and coffee and tea during the afternoon break in the foyer of Room A (Ohtori-Higashi) and outside Room G (Yakumo).

Currency Exchange and Banking Service

City banks remain open Monday through Friday from 9:00 to 15:00, and from 9:00 to 12:00 on Saturday. They close on the second and third Saturdays of every month, Sundays and national holidays*. Major currencies can be exchanged at principal hotels, including the ANA Hotel Tokyo. * (15 September is a national holiday.)

Nearby banks are Mitsubishi (next to the ANA Hotel Tokyo), Mitsui and Fuji in the ARK Hills Mori Building.

The NOC Secretariat does not offer currency exchange service.

Postal Service

Mail service will be available at the Mail Service Desk in the B1 lobby on the morning of 12 September and all day 8 to 16 September (No service on 13 september). World Wide Express (DHL) will also operate according to the same schedule.

The nearest post office is in the ARK Hills Mori Building adjacent to the ANA Hotel. Business hours are 9:00 to 17:00 Monday through Friday, and from 9:00 to 12:30 on Saturday (closed on Sundays and national holidays). The Tokyo Central Post Office and several other big post offices in Tokyo are open on Sundays and national holidays.

Lunch and Dinner

The ANA Hotel Tokyo has seven restaurants and two tea lounges.

Restaurants outside the ANA Hotel serving recommendable cuisine are listed in the "For Your Better Enjoyment of Dining and Shopping in Tokyo" distributed at registration. Additional copies of this pamphlet may be obtained at the General Information Desk.

Travel Agent

The Japan Travel Bureau, Inc. (JTB), the official travel agent for the Session, will operate its information desk in the B1 lobby during the Session. Information on Tokyo and a variety of tours as well as air tickets can be obtained at the desk.

Other Information

For other general information such as shopping, tipping, taxis, embassies, etc., please refer to the JTB travel kit "Japan" distributed at the time of registration.

Exhibitions and Demonstrations

Exhibitions

The following exhibitions will be held in Room C (Ohtori-Nishi) 9 through 11 September and on the morning of 12 September.

- Official statistical publications for free distribution
- Statistical publications for sale
- Computers and other office machinery
- Winning works of statistical graph contests

Pamphlets on the exhibition will be available at the entrance of the room.

Demonstrations

The Statistics Bureau and the Statistics Center of Japan will make the following demonstrations 9 through 11 September and on the morning of 12 September in Room C (Ohtori-Nishi).

(a) Cross-sectional statistical data base

(b) Use of image data for census coding

(c) Data communication between OECD and the Statistics Bureau

An oral presentation for theme (a) will be made on 10 September, and for themes (b) and (c) on 11 September, using the necessary computer equipment. During the entire period of demonstrations, persons in charge will be present at the site to give explanations on request.

Pamphlets on the demonstrations will be available at the entrance of the room.

Social Events

Welcoming Reception

8 September (Tues.), 17:30 ~ 19:30

All registered participants and their accompanying persons are invited to a reception hosted by the Chairman of the National Organizing Committee and the Minister of State, Management and Coordination Agency. Individual invitations will be issued.

Sayonara (Farewell) Party

15 September (Tues.), 19:00 ~ 21:00
Special Fee : ¥ 5,000 per person

Tickets may be purchased at the Excursions and Sayonara Party Desk in Room F (Zuiun II and III) 7 and 8 September and at the General Information Desk in the B1 lobby on and after 9 September.

Excursions

The following day excursions are arranged for participants and their accompanying persons on Sunday, 13 September. Tickets can be purchased at the Excursions and Sayonara Party Desk in Room F (Zuiun II and III) 7 and 8 September and at the General Information Desk in the B1 lobby on and after 9 September.

13 September (Sun.)

EX1 : Hakone, 8:30~18:00
Fee : ¥ 6,000 (Lunch included)

A relaxing motorcoach drive to Hakone, one of Japan's most celebrated resorts. Visit Owakudani Valley and view the boiling hotsprings. Afternoon, a cruise on Lake Hakone (Lake Ashi), and visit the Open-Air Museum with its magnificent sculpture exhibition. Early evening "Bullet" train back to Tokyo.

EX2: Museum / Sumo Tournament, 10:00~18:30
Fee : ¥ 6,000 (Lunch included)

Drive along Higashi Kanto Expressway to the National Museum of Japanese History, a new research center displaying objects rich in historical and in cultural interest. Then stop at Ryogoku Kokugikan Hall to enjoy Sumo Tournament (Japanese traditional wrestling).

EX3: Nikko, 7:40~20:00
Fee : ¥ 6,000 (Lunch included)

Morning transfer to Nikko National Park, with a visit to famous Toshogu Shrine with noted "Yomeimon Gate". Afternoon, enjoy a motorcoach ride on Irohazaka Driveway (48 hairpin curves) to Lake Chuzenji and a visit to Futaarasan Shrine and Tachiki Kannon Temple. Early evening limited-express train back to Tokyo.

Programmes for Accompanying Persons

A variety of family programmes are offered at special discount for those wishing to see and to learn more of Japan.

Tickets can be purchased at JTB desk in Room F (Zuiun II and III) on 7 and 8 September and at JTB desk in the B1 lobby on and after 9 September.

AP1: Tokyo City Tour
Date: 10 September (Thur.), 8:30~12:30
Fee : ¥ 3,000

Half-day sightseeing in Tokyo, visiting Tokyo Tower for panoramic view of the city, East Gardens of Imperial Palace and Asakusa Kannon Temple with its bustling arcade of souvenir shops.

AP2: Technical Tour to NTT (Nippon Telegraph & Telephone Corp.)
Date : 9 September (Wed.) and 14 September (Mon.), 13:00~16:00, respectively
Fee : ¥ 2,000

Afternoon technical visit to NTT Kasumigaseki Communication Center with its facilities composed of various Office Automation (OA) systems. This facility is well-known as one of the most advanced telecommunication center in Japan.

AP3: Country & Crafts
Date : 9 September (Wed.), 9:00~18:00
Fee : ¥ 9,000 (Lunch included)

Full-day sightseeing around Tokyo, visiting Kikkoman Noda Soy Sauce Plant, Daruma (paper wish-making doll) making company, gardening market noted for Bonsai and Togyoku Doll Shops.

AP4: Japanese Cooking
Date : 10 September (Thur.), 12:30~16:00
Fee : ¥ 6,000

Learn through demonstration not only how to select ingredients and cook them but also the Japanese way of arranging and serving food, as well as the correct way to eat. After demonstration, you will have an opportunity to enjoy the cuisine.

AP5: Kimono & Flower Arrangement
Date : 12 September (Sat.), 13:00~16:30
Fee : ¥ 6,000

"Kimono" is the traditional attire of Japan. You will learn how to wear the Kimono.

"Flower Arrangement" or Ikebana, a Japanese idea of flower arranging is something that brightens colours and gives life to our environment.

AP6: Night Tour to Kabuki Theatre
Date : 14 September (Mon.), 16:00 ~19:30
Fee : ¥ 4,500

Night tour to Kabuki Theater to enjoy the Japan's traditional performing art "Kabuki". The tour also includes a visit to Asakusa Kannon Temple and the arcade of souvenir shops.

AP7: Technical Tour to Nissan Motor Co.
Date : 11 September (Fri.), 8:30~17:00
Fee : ¥ 6,000 (Lunch included)

Morning Technical visit to Zama Plant of Nissan Co., one of Nissan's five major assembly plants.

AP8: Technical Tour to Yamanashi Winery and Hakushu Distillery of Suntory, Inc.
Date : 11 September (Fri.), 8:00~19:00
Fee : ¥ 6,000 (Lunch included)

Morning motorcoach to Yamanashi via Chuo Expressway. Visit to Suntory's Yamanashi Winery, the largest winery in the Orient. Barbecue lunch at the winery. Afternoon visit to Suntory's Hakushu Distillery. Evening return to Tokyo.

AP9: Technical Tour to NEC "C&C Plaza"
Date : 11 September (Fri.), 13:00~16:00
Fee : ¥ 2,000

Afternoon technical visit to NEC Computer & Communications Plaza (C&C Plaza), a totally unique computer and communication showroom which gives an intriguing insight to the future.

AP10: Full-Day City Tour
Date : 15 September (Tues.), 9:00~17:30
Fee : ¥ 9,000 (Lunch included)

Full-day sightseeing in Tokyo, visiting Meiji Shrine which is Japan's largest Shinto's shrine, Harajuku, National Museum with countless relics of Japanese history, and Ginza, one of the most sophisticated shopping and amusement area in the Orient.

Notes:

- *Some of the tours listed in Bulletin 2 were cancelled because of insufficient number of participants.*
- *The number of persons in each course may be limited in the order of applications received.*
- *The places to be visited are subject to change with or without notice.*

Post-Session Tours

For the participants and accompanying persons who wish to see more of Japan during their stay in this country, a variety of tours after the Session are arranged by JTB.

Tickets can be purchased at JTB desk in Room F (Zuiun II and III) from 7 to 8 September and at JTB desk in the B1 on and after 9 September.

PS1: Kyoto/Nara 3 Days Tour (2 lunches included)
Departure : 17 September (Thur.)
Tour Fee : ¥ 75,500 per person (double occupancy)
¥ 86,500 per person (single occupancy)

Itinerary :
17 Sept. (Thur.) *Tokyo-Kyoto*
"Bullet" train to Kyoto. Then, half-day sightseeing in Kyoto visiting Sanjusangendo Hall, Heian Shrine and Kiyomizu Temple. Accommodation in Kyoto for two nights.

18 Sept. (Fri.) *Kyoto*

Morning sightseeing in Kyoto, visiting Nijo Castle, Higashi-Honganji Temple and Old Imperial Palace. Afternoon free.

19 Sept. (Sat.) *Kyoto-Nara-Kyoto-Tokyo*

Full-day excursion to Nara, visiting Phoenix Temple, Todaiji Temple, Kasuga Shrine and Kofukuji Temple. Evening "Bullet" train to Tokyo.

PS2: Japan, Today & Yesterday (1 dinner & 1 breakfast included)
Departure : 16 September (Wed.)
Tour Fee : ¥ 49,500 per person (double occupancy)
¥ 54,500 per person (single occupancy)

Itinerary :

16 Sept. (Wed.) *Tokyo-Okitsu-Toro-Yaizu-Tsumagoi*

Motorcoach to Tsumagoi, with visits to Seikenji Temple in Okitsu, Fish Market in Yaizu, etc. Accommodation in Tsumagoi.

17 Sept. (Thur.) *Tsumagoi-Lake Hamana-Arimatsu-Nagoya*

Motorcoach to Nagoya, with visits to Yamaha Motor Plant and Ryotanji Temple, etc. Accommodation in Nagoya.

18 Sept. (Fri.) *Nagoya-Hikone-Koga-Shigaraki-Kyoto*

Motorcoach to Kyoto, visiting to Hikone Castle, the house of "Ninja" in Koga, etc.

Note: *Reservation for hotels in Kyoto will be made only upon request, since the tour disbands on arrival at major hotels in Kyoto.*

PS3: Hakone/Pearl Island/Kyoto 5 Days Tour (4 lunches included)
Departure: 17 September (Thur.)
Tour Fee: ¥ 120,000 per person (double occupancy)
¥ 141,900 per person (single occupancy)

Itinerary :

17 Sept. (Thur.) *Tokyo-Kamakura-Hakone*

Morning drive to Hakone with sightseeing in Kamakura. Accommodation in Hakone.

18 Sept. (Fri.) *Hakone-Odawara-Nagoya-Toba*

Transfer to Toba by "Bullet" train and limited express train, with sightseeing in Toba. Accommodation in Toba.

19 Sept. (Sat.) *Toba-Ise-Kyoto*

Morning visit to Pearl Island. Afternoon drive to Kyoto. Accommodation in Kyoto for two nights.

20 Sept. (Sun.) *Kyoto-Nara-Kyoto*

Full-day sightseeing in Kyoto and Nara, visiting Phoenix Temple, Todaiji Temple, Kasuga Shrine and Deer Park.

21 Sept. (Mon.) *Kyoto*

Half-day sightseeing in Kyoto, visiting Nijo Castle, Higashi-Honganji Temple and Old Imperial Palace.

Note: *Tour disbands upon return to the hotel in Kyoto.*

Ⅲ. 蒐 集 資 料 目 錄

1．PROGRAMME，International Statistical Institute, 46 th Session（別途備置）

2．招請論文（Invited Papers）全 31 編（別途備置）
寄託論文（Contributed Papers）全 300 編（發表分 46 編 包含）（別途備置）

3．主催側 演說文（本文收錄）

4．主催側 公告（Bulletin）第 1 號～第 7 號

5．發文發表者 名單（本文收錄）

6．會議參席者 名單（本文收錄）

7．論文提出者 名單

46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

DAILY BULLETIN

8 SEPTEMBER 1987 | No. 1 | 8 SEPTEMBRE 1987

WELCOME TO THE ISI TOKYO SESSION

Message from the National Organizing Committee

The National Organizing Committee has the pleasure of extending a cordial welcome to the members of the International Statistical Institute and its Sections as well as all the guests who are now participating in the 46th Session of the ISI in Tokyo. The Committee firmly believes that the Session will further promote global cooperation in developments of statistics and statistical sciences through presentation and exchange of views among participants.

The Committee hopes that the participants will find the meetings interesting and informative, while enjoying social programmes which introduce various aspects of Japan.

BIENVENUE A LA SESSION DE TOKYO DE L'IIS

Message du Comité National d'Organisation

Le Comité National d'Organisation a le plaisir de souhaiter la bienvenue aux membres de l'Institut International des Statistiques et de ses sections ainsi qu'à tous les invités qui participant actuellement à cette 46ème session de l'IIS à Tokyo. Notre Comité a la profonde conviction que la présente session pourra davantage promouvoir la coopération globale dans le développment des statistiques et des sciences statistiques de par la présentation et l'échange des points de vue des participants.

Le Comité espère que les participants trouveront les réunions intéressantes et instructives et qu'ils apprécieront dans le même temps les programmes récréatifs qui leur présenteront divers aspects du Japon.

CONGRATULATIONS

The Order of the Sacred Treasure, Gold and Silver Star is conferred today on Dr. E. Lunenberg, Director of the ISI Permanent Office, for his outstanding contribution to developments of statistics and statistical sciences in Japan and promotion of friendly relations between the Netherlands and Japan.

OPENING CEREMONY

The Opening Ceremony of the Session takes place this afternoon from 15:30 to 16:30 in Suntory Hall next to the ANA Hotel Tokyo. Members of the ISI and its Sections are invited to attend the Ceremony. Please be sure to finish registration before the Ceremony. The Registration Desk is in Room F (Zuiun II and III), B1, today. The Desk will operate in B1 Lobby on and after 9 September.

PROVISIONAL LIST OF PARTICIPANTS

A provisional list of participants will be available at the Registration Desk. It includes the names of those who had registered up to 26 August 1987.

An updated list will be issued during the Session. Participants are advised to check the list and inform the NOC Secretariat of any corrections to be made before the closure of the Session.

TELEPHONE NUMBERS OF THE NOC SECRETARIAT

Telephone Numbers of the NOC Secretariat are 505-4201, 505-4202 (Direct), and 505-1111 ext. 5491.

ALLOCATION OF MEETING ROOMS

Participants who wish to arrange informal meetings should apply for room space to the NOC Secretariat (Mr. Makino, extension 5491).

ISI GENERAL ASSEMBLY - Provisional Agenda

Meeting I - Thursday morning, 10 September 1987

1. Opening

2. Presentation and discussion of the Report of the Executive Committee.
   Copies have been circulated by mail to all members.

3. Finance
   (a) Presentation and discussion of the Financial Report.
   Copies have been circulated by mail to all members.

   (b) Election of Financial Auditors to examine the Financial Report.

   (c) In accordance with Netherlands law, a Financial report is to be presented to a meeting of members within six months of the end of the fiscal year, unless the General Assembly agrees to extend this period. The Assembly is invited to extend this period until the next ordinary Session.

4. Appointment of Officers and Council Members.
   According to art. 6 of the Statues, Officers and Council Members are to be appointed by the General Assembly at each ordinary Session from a binding nomination. The binding nomination which was decided by all individual members through a mail vote, is as follows:

   President-Elect : G. Kulldorff (Sweden)
   Vice President : B. Afonja (Nigeria)
   Li Chengrui (China)
   W.R. Van Zwet (Netherlands)

   Council Members (1987 - 1991):

   L. Biggeri (Italy)
   M.A. Korolev (USSR)
   T.A. Mijares (Philippines)
   K. Neumann (DDR)
   M.H. Regier (Lebanon)
   G. Théodore (France)
   Wang Shou Ren (China)
   V.J. Yohai (Argentina)

. Announcement of the composition of the Nominations Committee.

. Determination of the number of vacancies in the 1988 and 1989 elections of ordinary members.

Meeting II - Tuesday afternoon, 15 September 1987

1. Future Sessions

2. Presentation of the Report of the Financial Auditors.

3. Report by Committees of the Institute:
   (a) Programme Committee for the 46th Session
   (b) Statistical Education Committee
   (c) Publications Committee
   (d) Other Committees

4. Reports by the Presidents of Sections

5. Any Other Business

NOTES:

1. Full participation in discussions and voting in the meetings of the ISI General Assembly is reserved for honorary, ordinary and *ex officio* members of the ISI.

2. *Ex officio* members entitled to participate fully in the meetings of the General Assembly are those included on the list posted near the ISI offices in the Conferences building, plus any who have presented their official credentials in writing to the ISI offices not later than 24 hours before the meeting.

3. Members of Sections who are interested in the proceedings of the General Assembly are welcome to attend as observers.

Procedural Guidelines for General Assembly Meetings

1. The time allotted to the introduction of a business item or the presentation of a report shall be determined by the presiding officer. Written reports and other documents that have been circulated before the meeting will not normally be read from the platform.

2. Before speaking, a member* must be recognized by the presiding officer, and the speaker's name should be announced. When necessary in order to conserve time the presiding officer may determine time limits for speakers. Any member wishing to make a first contribution to a discussion shall have priority over all who have already spoken.

3. Speakers may use the English or French language (and any other Conference language for which simultaneous interpretation is available). In order to facilitate simultaneous interpretation, a speaker not using the language of the previous speaker should first announce his change of language and then pause briefly before his contribution. Speakers must speak slowly and always into the microphone.

4. Any member of ISI may present a motion (i.e. a proposal for decision); this will be considered only if it is seconded (i.e. supported) by another ISI member.

5. Any member of ISI may move an amendment (i.e. a modification) to a motion or to a previously proposed amendment; it will be considered only if it is seconded.

6. Voting on amendments shall take place in the reverse order of their presentations. When all the amendments to a motion have been voted upon, the motion together with those amendments that have been carried shall be voted upon.

7. A motion to discontinue the discussion of a business item or motion shall (if seconded) be voted upon immediately without discussion.

8. A motion to postpone a business item or motion, for consideration at a later stage of the meeting or at a specified subsequent meeting, shall (if seconded) be discussed and voted upon before further discussion of the business item or motion.

9. Any member wishing to request that an item be included in the agenda should inform the Secretary/Treasurer at least 48 hours before the scheduled meeting of the General Assembly.

10. Full discretion in the interpretation of these guidelines and in the conduct of business shall rest with the presiding officer.

* member = honorary, ordinally, *ex officio* member of International Statistical Institute

CHANGES IN SCIENTIFIC PROGRAMME

9 Sept. (Wed.) Morning

Topic 140 Room H2 (Seiun II)
Added: 145.6 P.L. Bupta, R.D. Gupta
Relative error in systems reliability. (p. 149)

Poster Meeting 1 Room C (Ohtori-Nishi)
Transferred: 1. G. Consonni (Poster Meeting 3 - 14 Sept. (Mon.) Morning)
A predictive approach to symmetry hypotheses testing.

Cancelled: 6. F. Malek
A study of ridge regression.

9 Sept. (Wed.) Afternoon

Topic 115 Room G (Yakumo)
Changed: Chairperson T. Yanagimoto

Cancelled: 115.1 E.J. Harner
Designing a matched case-control study of occupational fatalities.

Topic 119 Room I (Ryoun)
Added: 120.1 R.C. Gupta, R.A. Albanese
Estimation of relative risk in epidemiological studies.
(P.151)

Topic 122 Room H1 (Seiun I)
Cancelled: 122.5 H. Mehdizadeh-Ashrafi
Population migration problem in sample cities in Iran.

ADMINISTRATIVE MEETINGS

The following meetings will be held during the lunch break (12:00 - 14:00).

	Room
9 September (Wed.)	
ISI Programme Committee	P (Toki)
ISI Ad Hoc Committee on the Provision for Statistics in the Life Sciences*	I (Ryoun)
Bernoulli Society Council	H1 (Seiun I)
IAOS Executive Committee	L (Chidori)
IASC Council	H2 (Seiun II)
IASS Programme Committee	J (Kujyaku)
10 September (Thur.)	
ISI Publications Committee	H2 (Seiun II)
ISI Research Centre Steering Committee	P (Toki)
Bernoulli Society Programme Committee	M Shirasagi)
IAOS Programme Committee	L (Chidori)
IASC Programme Committee	K (Hibari)
IASS Council	Hl (Seiun I)
11 September (Fri.)	
ISI Programme Co-ordinating Committee	H1 (Seiun I)
ISI Nominations Committee	P (Toki)
ISI Statistical Education Committee	H2 (Seiun II)
Bernoulli Society General Assembly (12:30 - 14:30)	A (Ohtori-Higashi)
IAOS General Assembly	F (Zuiun II & III)
14 September (Mon.)	
ISI Programme Co-ordinating Committee	P (Toki)
ISI Ad Hoc Committee on the Provision for Statistics in the Life Sciences*	I (Ryoun)
Bernoulli Society Council	H1 (Seiun I)
IAOS Executive Committee	L (Chidori)
IASC General Assembly	A (Ohtori-Higashi)
IASS General Assembly	B (Ohtori-Naka)

15 September (Tues.)

ISI Publications Committee	I (Ryoun)
ISI Nominations Committee	G (Yakumo)
ISI Statistical Education Committee	H2 (Seiun II)
ISI Research Centre Steering Committee	P (Toki)
IAOS Programme Committee*	L (Chidori)
IASS Council	H1 (Seiun I)

16 September (Wed.)

IAOS General Assembly	F (Zuiun II & III)
IASC Council	H2 (Seiun II)

*Newly added to the administrative meetings listed in the "Outline of the Session Schedule" in the Programme (pp. 8-13)

OTHER INFORMATION

EMERGENCY CALLS

In case of emergency, please call ANA Hotel Tokyo, (505)4230, 4231 or 4202. From guest rooms in ANA Hotel Tokyo, dial extention 1.

LUNCH AT ADMINISTRATIVE MEETINGS

The ANA Hotel Tokyo will serve sandwiches and coffee for the participants (¥2,000 per person) at administrative meetings to be held during the lunch break (excluding the General Assemblies of the Sections).

Chairpersons of the meetings where the lunch will be served are advised to make reservations by calling the NOC Secretariat (Mr. K. Makino, ext. 5491) by 16:00 the day before each meeting. Please pay in cash at the meeting.

MAIL SERVICE

Mail service will be available at the Mail Service Desk in the B1 Lobby from 11:00 to 18:00 Monday through Friday and 9:30 to 12:30 Saturday. (No service on Sunday, 13 September.)

SNAPSHOTS

Commercial snapshots will be taken on various occasions and will be displayed in Room C (Ohtori-Nishi) during the Session. Detailed information will be available in the same room.

TEA CEREMONY

Participants and accompanying persons are invited to the tea ceremony which will take place Friday, 11 September (10:00 - 12:00 ; 13:00 - 15:00) in the Hospitality Corner in Room C (Ohtori-Nishi). Experts from the Urasenke School of Tea will demonstrate the traditional tea ceremony which was completed in its present form by Sen Rikyu in the 16th century.

Tea and sweets will be served for all the guests.

JAPANESE TRADITIONAL CRAFT

An exhibition of *kimekomi-ningyo*, kimono clad wooden dolls made in the traditional *kimekomi* technique, will be held by the Mataro Doll Craft Academy in the Hospitality Corner in Room C (Ohtori-Nishi) from 10 to 14 September.

A gathering for learning *kimekomi* craft will also be held in the Hospitality Corner on 14 September, from 14:00 to 16:00. Participants will be given instruction from teachers of the Academy and may keep their creations as souvenirs. Please get detailed information and make reservations in the Hospitality Corner.

CHANGE IN SOCIAL EVENTS

AP2: The technical visit to NTT Kasumigaseki Communuication Center on ~~8~~ 15 September has been cancelled (~~15~~ 9 September only).

Rules for the Daily Bulletin

The Daily Bulletin is issued on Monday through Saturday during the Session from 8 to 16 September 1987.

Copies of the Bulletin are available at 8:00 every morning except Sunday at the Daily Bulletin Desk and the General Information Desk on the B1 floor.

The Daily Bulletin contains changes in the programmes, announcements of committee meetings and social events, and other communications of interest to participants within the scope of the Session.

The participants who wish to have announcements put in the Daily Bulletin should submit copies of the announcements by 15:30 (13:00 on Saturday) to the office of the NOC Secretariat in Room E (Zuiun I) on the B1 Floor.

The copies should be typed or neatly written in English and/or French, and will be published in the language as submitted.

Decisions regarding the inclusion of the announcements in the Bulletin and the form of presentation shall rest with the ISI Permanent Office and the National Organizing Committee.

Réglements concernant le Bulletin quotidien

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46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

DAILY BULLETIN

9 SEPTEMBER 1987 | No. 2 | 9 SEPTEMBRE 1987

VIDEO RECORDING OF INVITED PAPERS MEETINGS

With the permission of the ISI Permanent Office, the National Organizing Committee will undertake video recording of invited papers meetings during this Session for record. Cooperation of the participants is requested.

NEWLY ELECTED ISI MEMBERS

Following the votes of the 1987 ISI Elections Committee, the people listed below have been elected as ordinary members of the ISI.

Al-Akel, A.	(Syria)	Dunsmore, I.R.	(U.K.)
Azzalini, S.	(Italy)	Elashoff, R.M.	(U.S.A.)
Baba, Y.	(Japan)	Ellenberg, J.H.	(U.S.A.)
Babeau, A.Y.G.	(Fance)	Franz, A.	(Austria)
Bertino, S.	(Italy)	Ghosh, J.K.	(India)
Boudoul, J.	(France)	Giovagnoli, A.	(Italy)
Broemeling. L.D.	(U.S.A.)	Gong, J.	(China)
Brown Jr., B.W.	(U.S.A.)	Gupta, C.	(U.S.A.)
Byun, Hyung Yoon	(Korea)	Hand, D.J.	(U.S.A.)
Cagiano de Azevedo, R.	(Italy)	Hansen, G.	(F.R.G.)
Change, Der-Shin	(China)	Hasegawa, M.	(Japan)
Chao, A.	(China)	Hidiroglou, M.A.	(Canada)
Chikuse, Y.	(Japan)	Inagaki, N.	(Japan)
Cook, R.D.	(U.S.A.)	Itoh, Y.	(Japan)
Cuadras, C.M.	(Spain)	Kala, R.	(Poland)
Debonneuil, M.	(France)	Kariya, T.	(Japan)
Deshpande, J.V.	(India)	Kempton, R.A.	(U.K.)
Diana, G.	(Italy)	Kent, J.T.	(U.S.A.)
Dobson, A.J.	(U.K.)	Kimber, G,R,	(U.K.)

Lefèvre, C.	(Belgium)
Le Hégarat, G.M.	(France)
Lery, A.J. -M.Y.P.	(France)
Letac, G.G.	(France)
Ma, Feng Shi	(China)
Malik, H.J.	(Canada)
Marcotorchino, J.F.	(France)
Matsunawa, T.	(Japan)
Mazodier, P.	(France)
Meeker Jr., W.Q.	(U.S.A.)
Murakami, M.	(Japan)
Natale, M.	(Italy)
Pagès, J.	(France)
Payne, R.W.	(U.K.)
Qian, B.	(China)
Quintano, C.	(Italy)
Rey, G.M.	(Italy)
Scheaffer, R.L.	(U.S.A.)
Shumway, R.	(U.S.A.)
Smythe, R.T.	(U.S.A.)
Soubie, P.	(France)
Taniguchi, M.	(Japan)
Tenenhaus, M.	(France)
Tranquilli, G.B.	(Italy)
Tsiatis, A.	(U.S.A.)
Vardi, Y.	(Israel)
Vita, L.	(Hungary)
Vogel, J.	(G.D.R.)
Walczak, T.	(Poland)
Washio, Y.	(Japan)
Whitehead, J.R.	(U.K.)
Williams, D.A.	(U.K.)
Zucchini, W.	

INTERNATIONAL STATISTICAL INSTITUTE POLICY REGARDING CHINA

The established policy of the International Statistical Institute regarding China is that there is only one China and that is the People's Republic of China. The Institute policy is that nothing in the proceedings of an ISI Session is to imply otherwise.

In order to implement this policy the following courses of action are to be carried out at the Tokyo Session.

1. Name badges of participants are to show only the names of participants and not to refer to their country. Participants who have already received a name badge referring to a country are urgently requested to exchange this for a revised one at the registration desk.

2. The ISI will issue a new list of participants at the Session which will reflect the ISI policy as stated above.

3. In the papers circulated to participants, the names of authors from China are to be read as follows:

   Name, ... , China.

4. The final proceedings of this Session will be published in accordance with the above-mentioned policy of the ISI.

ISI NOMINATIONS COMMITTEE

The ISI Council has appointed the following members to serve on the Nominations Committee.

Chairman*	:	G.G.W Kalton	(UK)
Members	:	O.O. Ajayi	(Nigeria)
		H. Akaike	(Japan)
		T.A. Mijares	(Philippines)
		K. Neumann	(G.D.R.)
		J.L. Norwood	(USA)
		J.L. Teugels	(Belgium)

All members of the ISI are invited to contact committee members with suggestions regarding potential candidates to serve as officers and council members of the Institute.

ISI PROGRAMME COMMITTEE

The ISI Council has appointed members of the ISI Programme Committee to assist in the preparation of the Scientific Programme for the 1989 Session in Paris. All members are invited to contact committee members with suggestions for possible topics to be included in the programme. The committee members are:

Chairman*	:	K.T. de Graft-Johnson	(Ghana)
Vice Chaiman	:	Y. Escoufier	(France)
Members	:	M.A.R. El Badry	(Egypt)
		G.K.G. Forbrig	(G.D.R.)
		D. Holt	(UK)
		R. Pyke	(Canada)
		K. Uemura	(Japan/WHO)

ANNOUNCEMENT TO THE PREVIOUS PROGRAMME COMMITTEE MEMBERS

The chairman of the previous Programme Committee Prof. S. Johansen wants to call a farewell meeting of the committee members.

All previous committee members are requested to come to the NOC Secretariat at 12:00, Friday, 11 September.

47TH ISI SESSION: PARIS, 29 AUGUST - 6 SEPTEMBER 1989

Information on the organization of the 47th ISI Session will be given during an informal meeting on Thursday, 10 September (12:00 - 13:00), in Room I (Ryoun).

IASC SATELLITE CONFERENCE

The IASC Satellite Conference site is:

Fuji Kenshu-jo
656 Shimowada, Susono-shi
Shizuoka Prefecture
Phone: 05599-7-0111

BERNOULLI SOCIETY EAST ASIAN AND PACIFIC REGIONAL COMMITTEE

A meeting of interested participants from the region will be held from 12:40 to 14:40, Saturday, 12 September in Room H1.

Committee members and all other interested are cordially invited to attend.

C.C. Heyde - P. Embrechts - D. Vere-Jones

CHANGES IN SCIENTIFIC PROGRAMME

9 Sept. (Wed.) Morning

Topic 140 Room H2 (Seiun II)

Transferred: 140.2 A.H. Khan (Topic 144 - 12 Sept. (Sat.) Morning)
Characterizations of the Pareto and the power function distributions through inverse and ratio order statistics. (p. 231)

Added: 145.6 P.L. Gupta and R.D. Gupta
Relative error in systems reliability. (p. 149)

Poster Meeting 1 Room C (Ohtori-Nishi)

Transferred: 1. G. Consonni (Poster Meeting 3 - 14 Sept. (Mon.) Morning)
A predictive approach to symmetry hypotheses testing. (p. 79)

Cancelled: 6. F. Malek
A study of ridge regression.

9 Sept. (Wed.) Afternoon

Topic 115 Room G (Yakumo)

Changed: Chairperson T. Yanagimoto

Cancelled: 115.1 E.J. Harner
Designing a matched case-control study of occupational fatalities.

Topic 119 Room I (Ryoun)

Added: 120.1 R.C. Gupta, R.A. Albanese
Estimation of relative risk in epidemiological studies. (p.151)

Topic 122 Room H1 (Seiun I)

Cancelled: 122.5 H. Mehdizadeh-Ashrafi
Population migration problem in sample cities in Iran.

Topic 135 Room I (Ryoun)
Transferred: (Topic 101 - 12 Sept. (Sat.) Morning)
135.3 M. M. Singh and G.K. Kanji
Fitting non-linear model with errors in both variables.
(P. 413)

10 Sept. (Thur.) Afternoon

Topic 5 Room A. (Ohtori-Higashi)
5.1 The signal to noise ratio and transformation.(G.E.P. Box): to be read by M. Muller

5.2 Plans d'expériences - une nouvelle méthode, simple et générale pour la détermination du modèle et l' optimatisation de la réponse.(M.G. Vigier): The reader not determined yet.

Topic 20 Room B (Ohtori-Naka)
20.2 Statistical databanks in the countries of centrally-planned economies with special reference to Poland.(T. Walczak): to be read by A. Marton

20.3 Application of database technology in the African context. (M.M. Jambwa and L. Olsson): to be read by Maxwebo

Topic 124 Room G. (Yakumo)
Changed: Chairperson J. Norwood

Topic 129 Room G (Yakumo)
Cancelled: 129.3 J. Asgari
The survey of statistical needs in the Islamic Republic of Iran.

Added: 102.4 M.S. Fong
Monitoring women's work in agriculture. (p. 115)

11 Sept. (Fri.) Morning

Topic 6 Room A, B (Ohtori-Higashi and Naka)

6.3 Rice Lecture: On the statistician's contribution to quality. (W.E. Deming)

Professor Deming does not attend this session. President Moriguti will give outline of Professor Deming's lecture.

Added: Discussants N. Kano and R. Hattori

11 Sept. (Fri.) Afaternoon

Topic 17 Room B (Ohtori-Naka)

17.3 Analysis of tropospheric and stratospheric ozone data for trend detection.(G.C. Tiao): ready by L.-M. Liu

Topic 106 Room G.(Yakumo)

Changed: Chairman C. O'Muicheartaigh

Added: Discussant T.M.F. Smith

Topic 127 Room H1 (Seiun I)

Changed: Chairperson M. Huzii

OTHER INFORMATION

LUNCH AT ADMINISTRATIVE MEETINGS

The ANA Hotel Tokyo will serve sandwiches and coffee for the participants (¥ 2,000 per person) at administrative meetings to be held during the lunch break (excluding the General Assemblies of the Sections).

Chairpersons of the meetings where the lunch will be served are advised to make reservations by calling the NOC Secretariat (Mr. K. Makino, ext. 5491) by 16:00 the day before each meeting. Please pay in cash at the meeting.

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46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

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DAILY BULLETIN

10 SEPTEMBER 1987 No. 3 10 SEPTEMBRE 1987

ISI

ISI PROGRAMME COMMITTEE - NEW CHAIRMAN

The appointed chairman of the ISI Programme Committee is unfortunately not able to attend the Tokyo Session. In view of the vital role which the chairman is to play in Tokyo in preparing the scientific programme for the Paris Session, the ISI Council has decided to appoint R. Pyke as the new chairman of the Committee.

ADMINISTRATIVE MEETING

In answer to enquiries participants are informed that administrative meetings, etc. are closed meetings to be attended only by the members of the Committees concerned (and possibly other invited persons).

Meetings of the General Assemblies of the Sections are, of course, open for attendance by all members of the Sections concerned. In general, other participants are welcome to attend as observers.

CORRECTIONS IN THE LIST OF NEWLY ELECTED ISI MEMBERS

Azzalini, S. should be Azzalini, A.

Change, Der-Shin should be Chang, Der-Shin

ANNOUNCEMENT

IAOS General Assembly

The first meetings of the IAOS General Assembly will be held during the present 46th Session of ISI in Tokyo. The provisional agenda for the meetings on 11 September and 16 September (both at 12:00 in room F) is as follows:

1. Opening and report on progress
2. Election of officers
3. Adoption of the Statutes
4. Finance
5. Discussion on the future of IAOS
6. Work plan of programme activities
7. Any other business

The following documents are available for IAOS members.
Report of the nominating committee
Financial Report 1986
Draft Statutes

A french version has also been prepared and photocopies will be made on request.

Copies may be requested from the ISI Permanent Office (Room N).

Bernoulli Society Meeting on Statistics, Earth and Space Sciences

Under the auspices i.e. of the Bernoulli Society, a meeting on Statistics, Earth and Space Sciences will be organized at the Katholieke Universiteit Leuven, Louvoin, Belgium during the period August 21 - 25, 1989, just prior to the 1989 ISI Session in Paris.

The meeting should provide a platform on which statisticians and physical scientists from the realm of earth and space sciences can meet.

Written suggestions for the scientific programme are welcomed by the local organizer J.L. Teugels or by the scientific secretary of the Bernoulli Society P. Embrechts. Please submit them to Ms. A.K. Komaki, NOC Secretariat (ext.5491).

Bernoulli Society East Asian and Pacific Regional Committee

A meeting of interested participants from the region will be held from 12:40 to 14:40, Saturday, 12 September in Room H1.

Committee members and all other interested are cordially invited to attend.

C.C. Heyde - P. Embrechts - D. Vere-Jones

IASC Programme Committee

The IASC Programme Committee for 1989 will be enlarged to IASC Council members, who did not have the opportunity to express their views before. The Committee will meet on Thursday, 10 September, at 12:00 in Room K as already announced.

IASS Council Meeting

We recall the IASS Council Meeting I, which will take place at 12:00 in Room H1.

IASS: Question and Answer Session for Statisticians from Developing Countries

A panel discussion will be held in Room G from 12:00 - 13:30 on Friday, 11 September. Please submit questions to Tim Holt via the message notice board.

IASS Workship Participants

The demonstration and instruction of PC-CARP will be held from 9:15 on Friday 11th September. Please assemble in Room H1.

Committee on International Relations in Statistics (CIRIS) of the American Statistical Association

The Committee will meet on Monday, 14 September from 17:00 to 18:00 in Room H1(Seiun I).

National Statistical Societies

The meeting of the Officers of the National Statistical Societies will take place on Monday, September 14 from 9:00 to 11:00 in Room D. Presidents and representatives of national, international and regional statistical societies affiliated with the ISI are encouraged to attend.

Italians Society of Statistics (SIS)

Prof. Giuseppe Leti, President of the Italian Society of Statistics (SIS), has the pleasure to invite the participants to the 46th ISI Session to the presentation of the book "Italian contributions to the methodology of statistics".

The book, edited by Prof. Alijhiero Naddeo, has been prepared and published by SIS for the ISI Centennial. The presentation of the book will take place on Thursday 10 September, at 12:00, in the room G (Yakumo), B1 Floor.

CHANGES IN SCIENTIFIC PROGRAMME

10 Sept. (Thur.) Afternoon

Topic 5 Room A (Ohtori-Higashi)

5.1 The signal to noise ratio and transformation.(G.E.P. Box): to be read by M. Muller.

Topic 20 Room B (Ohtori-Naka)

20.2 Statistical databanks in the countries of centrally-planned economies with special reference to Poland.(T. Walczak): to be read by A. Marton.

20.3 Application of database technology in the African context. (M.M. Jambwa and L. Olsson): to be read by Maxwebo.

Topic 24 Room F (Zuiun II and III)

Correction: Chairperson Y. Mittal

Topic 129 Room G (Yakumo)

Cancelled: 129.3 J. Asgari
The survey of statistical needs in the Islamic Republic of Iran.

Added: 102.4 M.S. Fong
Monitoring women's work in agriculture. (p. 115)

Topic 124 Room G (Yakumo)

Changed: Chairperson J.L. Norwood.

Changed: By title International comparisons of prices using traditional index numbers.(R.P. Srivastava): to be orally presented. (p. 423)

11 Sept. (Fri.) Morning

Topic 6 Room A, B (Ohtori-Higashi and Naka)

6.3 Rice Lecture: On the statistician's contribution to quality. (W.E. Deming)
Professor Deming does not attend this session. President Moriguti will give outline of Professor Deming's lecture.

Added: Discussants N. Kano and R. Hattori.

11 Sept. (Fri.) Afternoon

Topic 17 Room B (Ohtori-Naka)

17.3 Analysis of tropospheric and stratospheric ozone data for trend detection.(G.C. Tiao): to be read by L.-M. Liu.

Topic 22 Room F (Zuiun II and III)

Changed: Chairperson M. Sibuya.

Topic 106 Room G (Yakumo)

Changed: Chairperson C. O'Muicheartaigh.

Added: Discussant T.M.F. Smith.

Topic 127 Room H1 (Seiun I)

Changed: Chairperson M. Huzii.

12 Sept. (Sat.) Morning

Topic 18 Room B (Ohtori-Naka)

18.2 Computerization in the design and exploitation of censuses and surveys in developing countries.(F. Azorín and A. De Miguel): to be read by M.P. Martín-Guzmán.

Topic 101 Room G (Yakumo)

Cancelled: 101.1 P. Rigo
Fuzzy sets and vague prior information in statistical inference. (P. 369)

Cancelled: 101.5 E.J. Wegman
On randomness, determinism and computability. (P. 465)

Added: 133.2 V.N. Murty and B.H. Bissinger
Testing hypotheses with confidence intervals. (P.309)

Added: 135.3 M. Singh and G.K. Kanji
Fitting non-linear model with errors in both variables. (P. 413)

Topic 123 Room I (Ryoun)
Changed: Chairperson M. Okamoto.

Topic 144 Room H1 (Seiun I)
Cancelled: 144.1 I.-S. Chang and C.A. Hsiung
Some asymptotic optimality results for censored data.

Added: 140.2 A.H. Khan
Characterizations of the Pareto and the power function distributions through inverse and ratio order statistics. (P. 231)

Added: 145.7 L.K. Chan, S.W. Cheng and F.A. Spiring
Some measures of process capability. (P. 61)

Topic 103 Room H1 (Seiun I)
Added: 103.3 C. Juyal
Statistical methodology for studying the status of women in the Indian handicrafts sector.

Added: 103.4 R. Champakalakshmi
Statistical methodology for enhancing the status of women through the family planning programme in India.

14 Sept. (Mon.) Morning

Topic 102 Room H1 (Seiun I)
Changed: Chairperson B. Bailar

Transferred: 102.4 M.S. Fong (Topic 129 - 10 Sept. (Thur.) Afternoon)
Monitoring women's work in agriculture. (p. 115)

Poster Meeting 3 Room C (Ohtori-Nishi)

Added: 1. G. Consonni

A predictive approach to symmetry hypotheses testing. (P. 79)

14 Sept. (Mon.) Afternoon

Topic 104 Room G (Yakumo)

Cancelled: 104.3 I. Alam and L.H. Lewis

Asian and Pacific Census Programme 1975-1984: a review of the use of census to investigate demographic topics. (P.13)

Added: 105.2 M. Sicron, Y. Hite and B. Lasman

Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (P. 409)

Topic 118 Room I (Ryoun)

Cancelled: 118.1 J.C. Abril

Edgeworth expansion for the density of a function of statistics whose density admits an expansion. (P. 1)

Added: A.K. Basu

Rate of approximation to CLT for sums of dependent random vectors with special applications to statistics.

Topic 120 Room H1 (Seiun I)

Transferred: (Topic 119 - 9 Sept. (Wed.) Afternoon)

120.1 R.C. Gupta and R.A. Albanese

Estimation of relative risk in epidemiological studies. (P. 151)

Topic 128 Room H2 (Seiun II)

Added: 141 R. Cagiano de Azevedo

Synchronisme et retards: note statistique sur la succession des événements. (By title) (P. 55)

CHANGES IN YESTERDAY'S SCIENTIFIC PROGRAMME

The following changes took place in yesterday's meetings.

Cancellations

Topic 2	Discussant:	M. Beyene and T.N. Güner
Topic 27	Discussant:	I.P. Fellegi
Topic 135	By title	D.S. Tracy and K.G. Jinadasa

Changes		As announced:	Changed to:
Topic 1	Discussants:	D.M. Gilford A. Martin	P.A. Bounpane G.J. Brackstone
Topic 135	Chairperson:	P.A. Lachenbruch	S. Konishi
Topic 27	27.2	Read by R.G. Bartram.	

The Following paper had been announced to be presented "by title" but was actually orally presented by the author.

Topic 114	By title	V.R. Sastry-Kuppa Interchangeability of units in a 2-stage survey design.

NOTICE

To Invited Speakers and Invited Discussants:

Interpreters would appreciate if they could receive in advance a copy of the paper to be orally presented or the gist of the paper in order to improve their interpretation. It is completely optional and the copy will be returned after the meeting concerned.

OTHER INFORMATION

DEMONSTRATION AND Q/A SESSION

There will be a demonstration and Q/A Session regarding ISSA (Integrated System for Survey Analysis)in the Function Corner on Friday, September 11, from 9:00 - 12:00 noon. ISSA is the micro-computer software package developed by the Demographic and Health Surveys Program (DHS).

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46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

DAILY BULLETIN

11 SEPTEMBER 1987 | No. 4 | 11 SEPTEMBRE 1987

ISI

Open Meeting 3 (ISI Scientific Programme) Cancelled

The Open Meeting 3 (ISI Scientific Programme) scheduled to take place on Friday, 11 September at 14:30 has been cancelled as it has not yet proved possible to finalize the report of the ISI Ad Hoc Committee to Study Preparation of Scientific Programmes.

Open Meeting on Statistical Development in Developing Countries

An open meeting on the role of ISI in the Development of Statistics in Developing Countries is to be held today, Friday, 11 September in Room H1. All interested participants are invited to attend.

To assist discussions at the meeting copies of a background paper "Integrated Approach towards Statistical Development in Developing countries" by K. Krickeberg are available from the ISI Permanent Office in Room N. Copies will also be available in the room where the meeting is to be held.

New ISI Executive Committee and Council

Following the vote of the General Assembly on 10 September, the membership of the ISI Executive Committee and Council to serve from the end of the Tokyo Session is as follows:

President	:	I.P. Fellegi	(Canada)
President-Elect	:	G. Kulldorff	(Sweden)
Vice-Presidents	:	Li Chengrui	(China)
	:	B. Afonja	(Nigeria)
	:	W.R. van Zwet	(Netherlands)

Council	:	L. Biggeri	(Italy)
(1987 - 91)	:	M.A. Korolev	(USSR)
	:	T.A. Mijares	(Philippines)
	:	K. Neumann	(DDR)
	:	M.H. Regier	(Lebanon)
	:	G. Théodore	(France)
	:	Wang Shou Ren	(China)
	:	V.J. Yohai	(Argentina)
(1985 - 89)	:	O.E. Barndorff-Nielsen	(Denmark)
	:	K. Krickeberg	(France)
	:	S.K. Mitra	(India)
	:	R.G. Moore	(UK)
	:	M.E. Muller	(USA)
	:	S. Nordbotten	(Norway)
	:	Kei Takeuchi	(Japan)
	:	G.N. Wilkinson	(Australia)
Ex Officio	:	S. Moriguti	(Japan/Past President)
	:	J.P. Le Gléau	(France/IARUS President)
	:	V. Nyitrai	(Hungary/IAOS President)
	:	M. Okamoto	(Japan/IASC President)
	:	C.O. O'Muircheartaigh	(Ireland/IASS President)
	:	W.R. van Zwet (Netherlands/Bernoulli Society President)	
	:	ISI Secretary/Treasurer	

ISI Member-Auditors

At its meeting of 10 September 1987 the General Assembly of the ISI appointed the following members to serve as member-auditors: G. Brackstone, E. Spjøtvoll.

The following terms of reference have been prepared for their easy reference.

a. The task of the member-auditors will be to engage in an in-depth examination of the Financial Report on behalf of the General Assembly, with the main purpose of recommending to the Assembly whether or not to approve the report.

b. In order to be able to discharge their duty, the member-auditors shall

(i) invite members present at the Session to inform them of any questions related to ISI programme expenditures which they may wish the auditors to investigate;

(ii) study and analyse the Financial Report in particular with respect to the allocation of funds to various programme components and line items;

(iii) request answers to any questions they may have from the responsible Officers and the Treasurer.

c. In reporting their findings to the General Assembly, the member-auditors shall give their views on

(i) matters of policies and priorities concerning the use of the Institute's funds;

(ii) any aspects of the Institute's financial management and administration which they have examined in greater detail than was presented in the Financial Report, and their findings;

(iii) the manner of presentation of the financial affairs of the Institute in the Financial Report;

(iv) the degree of satisfaction they have derived from the information received from the responsible officers in answer to their questions.

d. In order to enable the Officers to comment on any question to be asked by the auditors or other intervention to be made in the General Assembly following the presentation of the member-auditors' report, the report is to be submitted to the Executive Committee for information at least 48 hours in advance of the General Assembly meeting concerned.

It is hoped that these brief guidelines will enable the member-auditors to fulfill their role and report effectively to the General Assembly.

Rescheduling of Second Meeting of the ISI Publications Committee

Members of the Publications Committee are advised that the meeting scheduled to take place at 12:00 on Tuesday 15 September has been rescheduled. The meeting will now take place at 9:00 on the same day in Room P.

ISI Membership - Nomination of New Members

All ISI members are reminded that they may nominate colleagues who are not members of ISI for membership and that the Tokyo Session provides a good opportunity to consider making a nomination. The necessary forms are available from the ISI Permanent Office in Room N: the forms are available only to ISI members.

Open Meeting on Provision for Statistics in the Life Sciences within ISI

An Open Meeting will be held on Monday, 14 September, 10:30 - 12:00 in Room G, and all participants interested in this topic are warmly welcomed. The Meeting is convened by the Ad Hoc Committee set up this year by the Executive (Chair: P. Armitage). The Committee will meet twice during the Session, and will welcome this opportunity to hear other views. Discussion will range over all aspects of ISI activity, particularly important points being (a) relations with the Biometric Society, and (b) interests of ISI Sections and the possible case for some new body to represent this topic within ISI.

ANNOUNCEMENTS

IAOS Programme Committee II

The 2nd Meeting of the IAOS Programme Committee will take place on Tuesday, 15 September, in Room L, at 9:00 (and not at 12:00, as previously announced.)

J.L. Bodin

IASC General Assembly Meeting: 14 September at 12:00

Provisional Agenda:

1.	President's Report	Dr. Neumann	20 minutes
2.	Report by Scientific Secretary	Dr. Brosveet	30 minutes
3.	Committee Report Summary	Dr. Chambers	20 minutes
4.	Discussion		10 - 30 minutes
5.	Address of New President	Dr. Okamoto	10 - 30 minutes

IASC Statistical Software Newsletter - Sample Copies

Sample copies of the Statistical Software Newsletter, a publication of the International Association for Statistical Computing and GSF Medis Institute are available through the ISI Permanent Office to interested participants.

IASS Local Representatives

A meeting of the IASS Local Representatives will be held on Friday, 11 September, at 11:00, in Room J.

The presence of all Local Representatives is kindly requested.

Committee on Internal Relations in Statistics (CIRIS) of the American Statistical Association

There is a change in the date, time and place of the Committee meeting. The Committee will meet today, 11 September in Room G from 10:00 to 11:00.

National Statistical Societies

The meeting of the Officers of the National Statistical Societies will take place on Monday, 14 September from 9:00 to 11:00 in Room D. Presidents and representatives of national, international and regional statistical societies affiliated with the ISI are encouraged to attend.

CHANGES IN SCIENTIFIC PROGRAMME

11 Sept. (Fri.) Morning

Topic 6 Room A, B (Ohtori-Higashi and Naka)

6.3 Rice Lecture: On the statistician's contribution to quality. (W.E. Deming)
Professor Deming does not attend this session. President Moriguti will give outline of Professor Deming's lecture.

Added: Discussants N. Kano and R. Hattori.

11 Sept. (Fri.) Afternoon

Topic 17 Room B (Ohtori-Naka)

17.3 Analysis of tropospheric and stratospheric ozone data for trend detection.(G.C. Tiao): to be read by L.-M. Liu.

Topic 22 Room F (Zuiun II and III)

Changed: Chairperson M. Sibuya.

Topic 106 Room G (Yakumo)

Changed: Chairperson C. O'Muicheartaigh.

Added: Discussant T.M.F. Smith.

Topic 127 Room H1 (Seiun I)

Changed: Chairperson M. Huzii.

Topic 132 Room H2 (Seiun II)

Changed: By title A bootstrap test for location in symmetric distributions.
(D. Alemayehu): to be orally presented. (p.15)

12 Sept. (Sat.) Morning

Topic 18 Room B (Ohtori-Naka)

18.2 Computerization in the design and exploitation of censuses and surveys in developing countries.(F. Azorín and A. De Miguel): to be read by M.P. Martín-Guzmán.

Cancelled: Discussant N.J.R. Williams.

Added: Discussant B.M. Fitzpatrick.

Topic 101 Room G (Yakumo)

Cancelled: 101.1 P. Rigo
Fuzzy sets and vague prior information in statistical inference.

Cancelled: 101.5 E.J. Wegman
On randomness, determinism and computability.

Added: 133.2 V.N. Murty and B.H. Bissinger
Testing hypotheses with confidence intervals. (p. 309)

Added: 135.3 M. Singh and G.K. Kanji
Fitting non-linear model with errors in both variables. (p. 413)

Topic 123 Room I (Ryoun)

Changed: Chairperson M. Okamoto.

Topic 144 Room H1 (Seiun I)

Cancelled: 144.1 I.-S. Chang and C.A. Hsiung
Some asymptotic optimality results for censored data.

Added: 140.2 A.H. Khan
Characterizations of the Pareto and the power function distributions through inverse and ratio order statistics. (p. 231)

Added: 145.7 L.K. Chan, S.W. Cheng and F.A. Spiring
Some measures of process capability. (p. 61)

Topic 103 Room H1 (Seiun I)

Added: 103.3 C. Juyal
Statistical methodology for studying the status of women in the Indian handicrafts sector.

Added: 103.4 R. Champakalakshmi
Statistical methodology for enhancing the status of women through the family planning programme in India.

14 Sept. (Mon.) Morning

Topic 111 Room G (Yakumo)

Added: A. Hoermann and H. Loewel
The time of onset of myocardial infarction based on the time of onset.

Topic 102 Room H1 (Seiun I)

Changed: Chairperson B. Bailar.

Transferred: 102.4 M.S. Fong (Topic 129 - 10 Sept. (Thur.) Afternoon)
Monitoring women's work in agriculture. (p. 115)

Poster Meeting 3 Room C (Ohtori-Nishi)

Added: 1. G. Consonni
A predictive approach to symmetry hypotheses testing. (p. 79)

14 Sept. (Mon.) Afternoon

Topic 104 Room G (Yakumo)

Cancelled: 104.3 I. Alam and L.H. Lewis
Asian and Pacific Census Programme 1975-1984: a review of the use of census to investigate demographic topics.

Added: 105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (p. 409)

Topic 118 Room I (Ryoun)
Cancelled: 118.1 J.C. Abril
Edgeworth expansion for the density of a function of statistics whose density admits an expansion.

Added: A.K. Basu
Rate of approximation to CLT for sums of dependent random vectors with special applications to statistics.

Topic 120 Room H1 (Seiun I)
Transferred: (Topic 119 - 9 Sept. (Wed.) Afternoon)
120.1 R.C. Gupta and R.A. Albanese
Estimation of relative risk in epidemiological studies. (p. 151)

Topic 128 Room H2 (Seiun II)
Added: 141 R. Cagiano de Azevedo
Synchronisme et retards: note statistique sur la succession des événements. (By title) (p. 55)

15 Sept. (Tues.) Morning

Topic 108 Room G (Yakumo)
Changed: Chairperson Y. Ohashi.

Topic 105 Room 1 (Ryoun)
Transferred: (Topic 104 - 14 Sept. (Mon.) Afternoon)
105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (p. 409)

Topic 121 Room H1 (Seiun I)
Cancelled: 121.4 W.-Y. Tsai
Estimation of bivariate density and hazard gradient from bivariate censored data.

Topic 146	Room H2 (Seiun II)	
Cancelled: By title	A.C. Rogers	
	Cluster analysis pertaining to the underground storage tank program of the Environmental Protection Agency.	

CHANGES IN YESTERDAY'S SCIENTIFIC PROGRAMME

The following changes took place in yesterday's meetings.

Cancellations

Topic 20	Discussant	N. Meite
Topic 129	129.2	L. Boubkraoui
	102.4	M.S. Fong
Topic 110	110.1	S.O. Adamu

Changes

Topic 5	5.2	Read by T. Haga.

The Following paper had been announced to be presented "by title" but was actually orally presented by the author.

Topic 124	By title	M.J. Mojarrad and A. Monajemi An approach to the problem of dual market prices.

OTHER INFORMATION

Kendall's "A Dictionary of Statistical Terms" Japanese Edition Will Be Published Soon

Japanese edition of M.G. Kendall and W.R. Buckland: A Dictionary of Statistical Terms, Fourth Edition which is one of ISI's publications will be published in October 1987. Translators are members of Chiba University Statistical Research Group: A. Asai, A. Hashimoto, H. Honda, M. Kurano, M. Ichikawa, M. Murakami, J. Nakagami, H. Shima, M. Taguri, H. Yanai, M. Yasuda. Publisher is MARUZEN. (A. Asai)

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Les copies devront être dactylographiées ou écrites clairement en anglais et/ou en français et seront publiées dans la langue dans laquelle elles auront été présentées.

Les décisions concernant l'introduction de ces annonces dans le Bulletin ainsi que la forme de leur présentation seront prises par le Bureau permanent de l'IIS et le Comité National d'Orgnisation.

46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

DAILY BULLETIN

12 SEPTEMBER 1987 | No. 5 | 12 SEPTEMBRE 1987

I S I

Open Meeting on Provision for Statistics in the Life Sciences within ISI

This meeting will be held on Monday, 14 September, 10:30 - 12:00 in room G. All interested Participants will be welcome.

P. Armitage

TOTSAS

Members of the ISI Task Force on Teaching Statistics of School Level will meet at the conclusion of the open meeting of the Education Committee on Monday, 14 September, at 9:00, in Room I.

Tokyo Session Name Badges

All participants are cordially reminded that they should contact the registration desk in order to arrange the removal of reference to a country on their Session name badge.

ANNOUNCEMENTS

Bernoulli Society: Reminder

A meeting of interested participants from the East Asian and Pacific region will be held today from 12:40 to 14:40 in room H1. It is to be stressed that all those concerned with statistics in this region are cordially invited to attend.

ISIRC: Confidentiality and Official Statistics

At 12:30 on Monday 14 September, a meeting will be held in room H2, open to anyone concerned about this topic. This purpose is to discuss whether ISIRC can and should act as a clearing house for current information on national legislation and practices, for example by maintaining an up-to-date file and by issuing an occasional news letter. ISIRC is prepared to consider undertaking this task, but careful examination of costs for a service to a small number of people is essential.

Anyone anxious to participate in such an activity but unable to attend the meeting should send his name and address to D.J. Finney (during this Senior or to ISI, Voorburg); if the suggestion is developed further, information on plans will be given later.

Additional List of Participants

The following participants registered on 8 - 10 September 1987.

Aleong, John
Afsarinejad, Kasra
Ancot, Jean-Pierre
Basu, Adhir Kumar
Basu, Asit P.
Benyaklef, Mostafa
Bergman, Bo L.S.
Cagiano de Azevedo, Raimondo
Chaubey, Yogendra P.
Chiang, Chin L.
Conrad, Simon Andrew
Dahlhaus, Rainer
Dell'atti, Angelo
Ekholm, Anders
Fong, Monica S
Frisén, Marianne E.
Gili, Adolfo
Girone, Giovanni
Godambe, V.P.
Goria, Mohammed
Gupta, Pushpa L.
Hanemberg, Robert
Hodono, Makoto
Hogg, Robert V.
Honda, Masayuki
Ihara, Masamori
Jabine, Thomas B
Jones, Richard H.
Jupp, Peter E.
Kallaa, Pius P.
Keller, Wouter J.
Klas, Anton
Klevmarken, N. Anders
Kubokawa, Tatsuya
Kulldorff, Gunnar
Laaksonen, Seppo
Leti, Giuseppe
Lo Presti, Mario
Lutz, Hansheinz
Mastrodonato, Antonio
Mellin, Ilkka
Metivier, Michel G.
Montanari, Giorgio E.
Mori, Toshio
Moussa, Mohamed A.A.
Neter, John
Nordberg, Leif B.
Oliver, Alan M.
Ondora, Jason O.
Palmgren, Juni

Panaretos, John
Passaquinoici, Maria S.
Piccoli, Antonio
Pynnönen, Seppo J.
Sato, Ryoichiro
Sen, Pranab K.
Smith, T.M. Fred
Sugiura, Nariaki
Takada, Yoshikazu
Takeda, Harumi
Tanaka, Yoshihiko
Terasvirta, Timo
Tsubaki, Hiroe
Tulya-Muhika, Sam
Uwoi, Tohru
Vaeth, Michael
Viertl, Reinhard K.
Weinreb, Jacqves
Westberg, Margareta
Yanagawa, Takashi
Coli, Mauro
Cressie, Noel A.C.
De Wolff, Pieter
El Khoury, Samir
Fabbris, Luigi
Hayashi, Kunihiko
Hayashi, Toshiharu
Inoue, Hiroshi
Liu, Cheng-Gee
Liu, Lon-Mu
Loynes, Robert M.
Madsen, Finn
Marliani, Gianni
Mu, Zhu
Nomura, Yoshiki
Park, Sung H.
Penkov, Boyan I.
Pesarin, Fortunato
Regier, Mary H.
Sacchetti, Dario
Shimizu, Kunio
Stram, Daniel O.
Torene, Robert
Trivellato, Ugo
Ueda, Fusa
Vuchkov, Ivan N.
Washio, Yasutoshi
Xekalaki, Evdokia

CHANGES IN SCIENTIFIC PROGRAMME

12 Sept. (Sat.) Morning

Topic 18 Room B (Ohtori-Naka)

18.2 Computerization in the design and exploitation of censuses and surveys in developing countries.(F. Azorín and A. De Miguel): to be read by M.P. Martín-Guzmán.

Cancelled: Discussant N.J.R. Williams.

Added: Discussant B.M. Fitzpatrick.

Topic 101 Room G (Yakumo)

Cancelled: 101.1 P. Rigo
Fuzzy sets and vague prior information in statistical inference.

Cancelled: 101.5 E.J. Wegman
On randomness, determinism and computability.

Added: 133.2 V.N. Murty and B.H. Bissinger
Testing hypotheses with confidence intervals. (p. 309)

Added: 135.3 M. Singh and G.K. Kanji
Fitting non-linear model with errors in both variables. (p. 413)

Topic 123 Room I (Ryoun)

Changed: Chairperson M. Okamoto.

Topic 144 Room H1 (Seiun I)

Cancelled: 144.1 I.-S. Chang and C.A. Hsiung
Some asymptotic optimality results for censored data.

Added: 140.2 A.H. Khan
Characterizations of the Pareto and the power function distributions through inverse and ratio order statistics. (p. 231)

Added: 145.7 L.K. Chan, S.W. Cheng and F.A. Spiring
Some measures of process capability. (p. 61)

Topic 103 Room H1 (Seiun I)

Added: 103.3 C. Juyal
Statistical methodology for studying the status of women in the Indian handicrafts sector.

Added: 103.4 R. Champakalakshmi
Statistical methodology for enhancing the status of women through the family planning programme in India.

14 Sept. (Mon.) Morning

Topic 111 Room G (Yakumo)

Added: A. Hörmann and H. Löwel
The time of onset of acute myocardial infarction (Augusburg Myocardial Infarction Register Study 1984/85).

Topic 102 Room H1 (Seiun I)

Changed: Chairperson S.G. Leaver.

Transferred back: 102.4 M.S. Fong
Monitoring women's work in agriculture.

Topic 139 Room H2 (Seiun II)

Changed: Chairperson A.M. Herzberg

By title Circular balanced uniform repeated measurements designs.(K. Afsarinejad): to be orally presented. (p. 5)

Poster Meeting 3 Room C (Ohtori-Nishi)

Added: 1. G. Consonni

A predictive approach to symmetry hypotheses testing. (p. 79)

14 Sept. (Mon.) Afternoon

Topic 104 Room G (Yakumo)

Cancelled: 104.2 L.A. Beccaria, A. Minujin and A. Orsatti

How population censuses measure economic characteristics in developing countries.

Cancelled: 104.3 I. Alam and L.H. Lewis

Asian and Pacific Census Programme 1975-1984: a review of the use of census to investigate demographic topics.

Added: 105.2 M. Sicron, Y. Hite and B. Lasman

Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (p. 409)

Topic 118 Room I (Ryoun)

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Edgeworth expansion for the density of a function of statistics whose density admits an expansion.

Added: A.K. Basu

Rate of approximation to CLT for sums of dependent random vectors with special applications to statistics.

Topic 120 Room H1 (Seiun I)

Transferred: (Topic 119 - 9 Sept. (Wed.) Afternoon)

120.1 R.C. Gupta and R.A. Albanese

Estimation of relative risk in epidemiological studies.

Topic 128 Room H2 (Seiun II)

Added: 141 R. Cagiano de Azevedo

Synchronisme et retards: note statistique sur la succession des événements. (By title) (p. 55)

15 Sept. (Tues.) Morning

Topic 108 Room G (Yakumo)
Changed: Chairperson Y. Ohashi.

Topic 105 Room I (Ryoun)
Transferred: (Topic 104 - 14 Sept. (Mon.) Afternoon)
105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates.

Topic 121 Room H1 (Seiun I)
Cancelled: 121.4 W.-Y. Tsai
Estimation of bivariate density and hazard gradient from bivariate censored data.

Topic 146 Room H2 (Seiun II)
Cancelled: By title A.C. Rogers
Cluster analysis pertaining to the underground storage tank program of the Environmental Protection Agency.

16 Sept. (Wed.) Morning

Topic 133 Room G (Yakumo)
Transferred: (Topic 101 - 12 Sept. (Sat.) Morning)
133.2 V.N. Murty and B.H. Bissinger
Testing hypotheses with confidence intervals.

Added: 109.5 R.W. Butler
Inference after trimming multivariate data with a Wilks' outlier statistic. (p. 53)

Topic 142 Room G (Yakumo)
Cancelled: 142.2 D. Dugue
Quelques réflexions sur le loto national français.

Topic 125 Room H1 (Seiun I)
Cancelled: 125.6 M. Taghvatalab
Housing rent in Iran.

Topic 131 Room H2 (Seiun II)
Changed: Chairperson J.K. Roy

16 Sept. (Wed.) Afternoon

Topic 4 Room F (Zuiun II and III)
Determined: Chairperson A. Kudo

4.2 The community based health information system being established in Tanzania.(C.P.B. Mkai): to be read by K. Uemura.

Topic 109 Room G (Yakumo)
Transferred:109.5 R.W. Butler (Topic 133 - 16 Sept. (Wed.) Morning)
Inference after trimming multivariate data with a Wilks' outlier statistic.

Topic 145 Room I (Ryoun)
Cancelled: 145.4 A.H. Westlund
On parameter constancy testing by a MOSUMSQ(OLS)-test.

Transferred: (Topic 140 - 9 Sept. (Wed.) Morning)
145.6 P.L. Gupta and R.D. Gupta
Relative error in systems reliability.

Transferred: (Topic 144 - 12 Sept. (Sat.) Morning)
145.7 L.K. Chan, S.W. Cheng and F.A. Spiring
Some measures of process capability.

Topic 126 Room H1 (Seiun I)
Changed: Chairperson H. Kudo

Topic 107 Room H2 (Seiun II)
Changed: 107.1 A.N. Shiryayev
Uniform weak convergence of semimartingales depending on parameters (with statistical applications).

CHANGES IN YESTERDAY'S SCIENTIFIC PROGRAMME

The following changes took place in yesterday's meetings.

Changes		As announced:	Changed to:
Topic 9	Chairperson:	A.K.M.G. Rabbani	G. Kalton
Topic 132	Chairperson:	E. Eaton	R.V. Hogg
Topic 17	17.1	Read by A.M. Herzberg.	

Correction

Topic 106	Chairperson:	C. O'Muircheartaigh

FROM THE EDITIONAL DESK

ISI is now in the middle of the Session. So far everything has gone well and is going smoothly, although minor problems have been happening continually and occupying the secretariat. It has been unusually but not really exceptionally hot and the weather has been erratic these days.

Fortunately, typhoons, which according to the past statistics favour September for their visit to Japan, do not seem to be interested in participating in our Session.

We are grateful to all participants for their cooperation. Have a pleasant weekend and be refreshed on Monday!

(K.T.)

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46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

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DAILY BULLETIN

14 SEPTEMBER 1987 | No. 6 | 14 SEPTEMBRE 1987

I S I

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P. Armitage

Correction: List of Participants Issued by the ISI

Page 8

Fourastie Jacqueline
Laboratoire Au Cnam Paris, France should read

Conservatoire National des Arts et Metiers, Paris.

Page 19

Muwanga-Zake, Elizabeth should read

Muwanga-Zake, E.S.K.

Page 23

Renato, Guarini should read

Guarini, Renato.

ANNOUNCEMENTS

New Bernoulli Society Officers and Council

	1985 - 87	1987 - 89
President	C.C. Heyde	W.R. van Zwet
President-Elect	W.R. Van Zwet	A.N. Shiryayev
Scientific Secretary	R. Sibson	P.A.L. Embrechts
Treasurer	N. Keiding	R.J. Serfling

Council

1983 - 87	1985 - 89	1987 - 91
E. Cinlar	R.J. Adler	P.J. Diggle
D.J. Daley	P.E. Greenwood	T. Kurtz
C.A.B. Dantas	P.A. Jagers	M. Metivier
K. Krickeberg	W. Klonecki	J. Oosterhoff
P. Ney	Yu. V. Prohorov	R.L. Smith
A.N. Shiryayev	R. Rebolledo	M. Wschebor

IASC Satellite Conference

The participants in the first IASC World Conference on Computational Statistics and Data Analysis are advised to take either of the two shuttle buses leaving for the conference site at 15:00 and 17:30, 16 September (Wednesday). They will leave from 'Group Entrance' on the first floor of the ANA Hotel. Usually it takes less than two hours. Due to heavy traffic in the rush hours, however, it would be more than three hours' ride for the second bus. The participants are recommended to try to catch the first 15:00 bus.

IAOS Conference 1988

As previously announced, a specific IAOS conference will be organized in Italy in October 1988.

IAOS members, who wish to make some suggestions on the style of this first conference or on the topics to be dealt with during this conference, are requested to forward their suggestions to any member of the IAOS Programme Committee present in Tokyo: namely C. Arvas, J.L. Bodin, L.B. de Cervetto, J. Ceska, B. Kiregyera, H. Wu. All the suggestions must reach the Programme Committee before Tuesday, 15 September at 9:00 at the latest.

Meeting of Executive Committee of the African Statistical Association (AFSA)

There will be a meeting of the Executive Committee of AFSA at 12:00 noon, Monday, 14 September, in room F.

Additional List of Participants

The following participants registered on 9 and 11 September 1987.

Afonja, Biyi
Amidi, Ali
Apelt, Siegfried K.
Fontes De Sousa, Naria De Fatima
Grohmann, Heinz
Hattori, Rokuro
Higuti, Isao
Huang, Wen-Tao
Ichimura, Minoru
Kawai, Saburo
Kitagawa, Yutaka
Nagai, Hiroshi
Narain, Prem
Odumuye, Olupero G.
Pfeifer, Dietmar
Rao, J.N.K.
Rhee, Hong J.

CHANGES IN SCIENTIFIC PROGRAMME

14 Sept. (Mon.) Morning

Topic 111 Room G (Yakumo)
Added: A. Hörmann and H. Löwel
The time of onset of acute myocardial infarction (Augusburg Myocardial Infarction Register Study 1984/85).

Topic 102 Room H1 (Seiun I)
Changed: Chairperson S.G. Leaver.

Transferred back: 102.4 M.S. Fong
Monitoring women's work in agriculture.

Topic 139 Room H2 (Seiun II)
Changed: Chairperson A.M. Herzberg

By title Circular balanced uniform repeated measurements designs.(K. Afsarinejad): to be orally presented. (p. 5)

Poster Meeting 3 Room C (Ohtori-Nishi)
Added: 1. G. Consonni
A predictive approach to symmetry hypotheses testing. (p. 79)

14 Sept. (Mon.) Afternoon

Topic 104 Room G (Yakumo)
Cancelled: 104.2 L.A. Beccaria, A. Minujin and A. Orsatti
How population censuses measure economic characteristics in developing countries.

Cancelled: 104.3 I. Alam and L.H. Lewis
Asian and Pacific Census Programme 1975-1984: a review of the use of census to investigate demographic topics.

Added: 105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates. (p. 409)

Topic 118 Room I (Ryoun)
Cancelled: 118.1 J.C. Abril
Edgeworth expansion for the density of a function of statistics whose density admits an expansion.

Added: A.K. Basu
Rate of approximation to CLT for sums of dependent random vectors with special applications to statistics.

Topic 120 Room H1 (Seiun I)
Transferred: (Topic 119 - 9 Sept. (Wed.) Afternoon)
120.1 R.C. Gupta and R.A. Albanese
Estimation of relative risk in epidemiological studies.

Topic 128 Room H2 (Seiun II)
Added: 141 R. Cagiano de Azevedo
Synchronisme et retards: note statistique sur la succession des événements. (By title) (p. 55)

15 Sept. (Tues.) Morning

Topic 108 Room G (Yakumo)
Changed: Chairperson Y. Ohashi.

Topic 105 Room 1 (Ryoun)
Transferred: (Topic 104 - 14 Sept. (Mon.) Afternoon)
105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates.

Topic 121 Room H1 (Seiun I)
Cancelled: 121.4 W.-Y. Tsai
Estimation of bivariate density and hazard gradient from bivariate censored data.

Topic 146 Room H2 (Seiun II)

Cancelled: By title A.C. Rogers

Cluster analysis pertaining to the underground storage tank program of the Environmental Protection Agency.

16 Sept. (Wed.) Morning

Topic 14 Room A (Ohtori-Higashi)

14.1 Simulating the process: survey training at the Census Bureau.(L. Solomon): to be read by R.E. Fay.

Topic 133 Room G (Yakumo)

Transferred: (Topic 101 - 12 Sept. (Sat.) Morning)

133.2 V.N. Murty and B.H. Bissinger

Testing hypotheses with confidence intervals.

Added: 109.5 R.W. Butler

Inference after trimming multivariate data with a Wilks' outlier statistic. (p. 53)

Topic 142 Room G (Yakumo)

Cancelled: 142.2 D. Dugue

Quelques réflexions sur le loto national français.

Topic 125 Room H1 (Seiun I)

Cancelled: 125.6 M. Taghvatalab

Housing rent in Iran.

Topic 131 Room H2 (Seiun II)

Changed: Chairperson J.K. Roy

16 Sept. (Wed.) Afternoon

Topic 4 Room F (Zuiun II and III)

Determined: Chairperson A. Kudo

4.2 The community based health information system being established in Tanzania.(C.P.B. Mkai): to be read by K. Uemura.

Topic 109 Room G (Yakumo)

Transferred: 109.5 R.W. Butler (Topic 133 - 16 Sept. (Wed.) Morning)
Inference after trimming multivariate data with a Wilks' outlier statistic.

Topic 145 Room I (Ryoun)

Cancelled: 145.4 A.H. Westlund
On parameter constancy testing by a MOSUMSQ(OLS)-test.

Transferred: (Topic 140 - 9 Sept. (Wed.) Morning)
145.6 P.L. Gupta and R.D. Gupta
Relative error in systems reliability.

Transferred: (Topic 144 - 12 Sept. (Sat.) Morning)
145.7 L.K. Chan, S.W. Cheng and F.A. Spiring
Some measures of process capability.

Topic 126 Room H1 (Seiun I)

Changed: Chairperson H. Kudo

Topic 107 Room H2 (Seiun II)

Changed: 107.1 A.N. Shiryayev
Uniform weak convergence of semimartingales depending on parameters (with statistical applications).

CHANGES IN SATURDAY'S SCIENTIFIC PROGRAMME

The following changes took place in Saturday's meetings.

Cancellations

Topic 18	Discussant:	I.S. Francis
Topic 101	101.2	M.L. Eaton
Topic 123	123.2	A. Prat, J. Ginebra, J.M. Catot and J. Lores
Topic 103	103.2	S. Sahli
	103.4	R. Champakalakshmi
Topic 143	143.6	M. Seoh and M.L. Puri

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The participants who wish to have announcements put in the Daily Bulletin should submit copies of the announcements by 15:30 (13:00 on Saturday) to the office of the NOC Secretariat in Room E (Zuiun I) on the B1 Floor.

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Ce Bulletin contient les modifications apportées aux programmes des réceptions et des excursions ainsi que toutes les communications pouvant intéresser les participants pendant la tenue de la Session.

Les participants désirant publier des annonces dans le Bulletin quotidien devront soumettre des copies de ces annonces jusqu'à 15 heures 30 (13 heures le samedi) au bureau du Secrétariat CNO de la salle E (Zuiun I) au sous-sol B1.

Les copies devront être dactylographiées ou écrites clairement en anglais et/ou en français et seront publiées dans la langue dans laquelle elles auront été présentées.

Les décisions concernant l'introduction de ces annonces dans le Bulletin ainsi que la forme de leur présentation seront prises par le Bureau permanent de l'IIS et le Comité National d'Orgnisation.

46th SESSION OF THE INTERNATIONAL STATISTICAL INSTITUTE

46ème SESSION DE L'INSTITUT INTERNATIONAL DE STATISTIQUE

DAILY BULLETIN

15 SEPTEMBER 1987 | No. 7 | 15 SEPTEMBRE 1987

ISI

Second Meeting of ISI General Assembly

The second Meeting of the ISI General Assembly will begin at 14:30 on Tuesday, 15 September 1987, in Room A. The revised agenda for the meeting is as follows:

1. Future Sessions
2. Presentation of the Report of the Financial Auditors
3. Report by Committees of the Institute:
   (a) Programme Committee for the 47th Session
   (b) Statistical Education Committee
   (c) Publications Committee
   (d) Ad Hoc Committee on the Provision for Statisticians in the Life Sciences within ISI
   (e) Other Committee
4. Reports by the Presidents of Sections
5. Report on ISI and Statistical Development in Developing Countries
6. Any Other Business

Report on An Integrated Approach towards Statistical Development in Developing Countries.

Copies of the Report on An Integrated Approach towards Statistical Development in Developing Countries are available from the ISI Permanent Office in Room N. All participants are invited to collect a copy.

ANNOUNCEMENTS

Bernoulli Society: Future Meetings

1. The 18th European meeting of statisticians, Berlit (DDR), 22 - 26 August, 1988. Local organiser: O. Bunke.
2. The 17th conference on stochastic processes and their applications, Rome (Italy), dates still to be confirmed. Local organiser: G. Koch (1988).
3. Bernoulli Society satellite meeting to the 47th session of the ISI. Topic: statistics, earth and space sciences, Leuven (Belgium), 21 - 25 August, 1989. Local organiser: J.L. Teugels.
4. 47th session of the ISI, Paris (France), 29 August - 6 September, 1989. Bernoulli Society Program Chairman: J.L. Teugels.
5. The 18th conference on stochastic processes and their applications, Madison, Wisconsin (USA), dates still to be confirmed (1989).
6. The 6th European young stasticians meeting, Bechyne (Czechoslovakia), 11 - 15 September, 1989. Contact persons: V. Lanska, M. Hala, M. Maly.

Details for some of the further meetings are already available. For any information, please contact the scientific secretary: Paul Embrechts department WNIF, Limburgs Universitaire Centrum, Universitaire Campus, B-3610 Diepenbeek, Belgium.

Second IAOS General Assembly Meeting

The second meeting of the IAOS General Assembly will be held in Room F on Wednesday, 16 September between 12:00 and 14:30. The revised agenda for this meeting is as follows:

1. IAOS Committees
2. Report of IAOS Programme Committee
3. Any other business

New IASC Officers and Council

President:	M. Okamoto	(Japan)
President-Elect:	J.M. Chambers	(USA)
Past President:	K. Newmann	(G.D.R.)
Vice President:	I. Francis	(New Zealand)
	T. Walczak	(Poland)
Scientific Secretary:	A. Hëvmann	(F.R.G.)
Treasurer:	J. Brosveet	(Norway)
Executive Driector:	P. Jarques, Director of the Permanent Office, ISI Members of the Council	

1985 - 1989		1987 - 1991	
R.O. Bartram	(USA)	Ding Diquing	(China)
T. Havranek	(Czechoslovakia)	M. Euriat	(France)
N. Lauro	(Italy)	P. Ihm	(F.R.G.)
J.C. Nordbotten	(Norway)	R.S. Mariano	(Philippines)
P. Sint	(Austria)	J. Sedvansk	(USA)
D. Wishart	(UK)	K. Tanabe	(Japan)

Additional List of Participants

The following participants registered on 8 and 12 September 1987.

Farrag, Abdelmegid
Fujii, Yoshio
Hyodo, Yoshifumi
Wu, C.F. Jeff

INVITED PAPERS

To Invited Authors and Invited Discussants

Invited authoris and invited discussants who wish to make modifications of their papers are requested to submit revised papers to the NOC Secretariat during the Session, or to the following address by 31 October 1987.

The National Organizing Committee
c/o Statistics Bureau
Management and Coordination Agency
19-1, Wakamatsu-cho
Shinjuku-ku, Tokyo 162
Japan

Please pick up at the NOC Secretariat special composition sheets for revised papers.

In case the revised papers will not arrive by the closing date, the initial papers will be published in the Proceeding.

CHANGES IN SCIENTIFIC PROGRAMME

15 Sept. (Tues.) Morning

Topic 29 Room F (Zuiun II and III)
Added: Discussant J.N.K. Rao.

Topic 108 Room G (Yakumo)
Changed back: Chairperson P. Armitage.

Topic 105 Room I (Ryoun)
Cancelled: 105.1 L. Herberger
The future of the population census: presented as introductory remarks at the Invited Papers Meeting No. 11 on Monday, 14 Sept.

Transferred: (Topic 104 - 14 Sept. (Mon.) Afternoon)
105.2 M. Sicron, Y. Hite and B. Lasman
Methods used for evaluating the 1983 census coverage and adjusting census results for population estimates.

Topic 121 Room H1 (Seiun I)
Cancelled: 121.4 W.-Y. Tsai
Estimation of bivariate density and hazard gradient from bivariate censored data.

Topic 146 Room H2 (Seiun II)
Cancelled: By title A.C. Rogers
Cluster analysis pertaining to the underground storage tank program of the Environmental Protection Agency.

16 Sept. (Wed.) Morning

Topic 14 Room A (Ohtori-Higashi)
14.1 Simulating the process: survey training at the Census Bureau.(L. Solomon): to be read by R.E. Fay.

14.3 Establishing and innovating statistical education programme for Nigeria's statistical system.(O.O. Ajayi and J.B. Coker): to be read by C.F. Adegbulugbe.

Topic 133 Room G (Yakumo)

Transferred: (Topic 101 - 12 Sept. (Sat.) Morning)

133.2 V.N. Murty and B.H. Bissinger
Testing hypotheses with confidence intervals.

Added: 109.5 R.W. Butler
Inference after trimming multivariate data with a Wilks' outlier statistic. (p. 53)

Topic 142 Room G (Yakumo)

Cancelled: 142.2 D. Dugue
Quelques réflexions sur le loto national français.

Topic 125 Room H1 (Seiun I)

Cancelled: 125.6 M. Taghvatalab
Housing rent in Iran.

Topic 131 Room H2 (Seiun II)

Changed: Chairperson J.K. Roy.

16 Sept. (Wed.) Afternoon

Topic 4 Room F (Zuiun II and III)

Determined: Chairperson A. Kudo.

4.2 The community based health information system being established in Tanzania.(C.P.B. Mkai): to be read by K. Uemura.

Topic 109 Room G (Yakumo)

Transferred: 109.5 R.W. Butler (Topic 133 - 16 Sept. (Wed.) Morning)
Inference after trimming multivariate data with a Wilks' outlier statistic.

Topic 145 Room I (Ryoun)

Cancelled: 145.4 A.H. Westlund

On parameter constancy testing by a MOSUMSQ(OLS)-test.

Transferred: (Topic 140 - 9 Sept. (Wed.) Morning)

145.6 P.L. Gupta and R.D. Gupta

Relative error in systems reliability.

Transferred: (Topic 144 - 12 Sept. (Sat.) Morning)

145.7 L.K. Chan, S.W. Cheng and F.A. Spiring

Some measures of process capability.

Topic 126 Room H1 (Seiun I)

Changed: Chairperson H. Kudo.

Topic 107 Room H2 (Seiun II)

Some changes of the order of presentation will be taken place. For the details, please check with the organizer or look at the poster put on the entrance of the session room.

Changed: 107.1 A.N. Shiryayev

Uniform weak convergence of semimartingales depending on parameters (with statistical applications).

CHANGES IN YESTERDAY'S SCIENTIFIC PROGRAMME

The following changes took place in yesterday's meetings.

Cancellations

Topic 15	Discussant:	A. Prat-Bartes
Topic 102	102.3	S. Nuss
Topic 104	104.4	R. Clairin and F. Gendreau.
Topic 120	120.3	M.A. Coppini
	120.5	J.R. Thompson
Poster	19.	S. Afshar
Meeting 4	20.	D.V. Chopra

OTHER INFORMATION

Annual Festival of Hikawa Shrine: 14 -15 September

Akasaka, Minato-ku, near Akasaka Subway Station on the Chiyoda line.

On the 15 September, 16 *mikoshis* (small shrines) carried on shoulders of parishioners will gather at Hikawa shrine at noon and proceed to the ARK Mori Bldg., arriving there around 14:30.

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Les décisions concernant l'introduction de ces annonces dans le Bulletin ainsi que la forme de leur présentation seront prises par le Bureau permanent de l'IIS et le Comité National d'Orgnisation.

ISI GENERAL ASSEMBLY - Provisional Agenda

Meeting I - Thursday morning, 10 September 1987

1. Opening

2. Presentation and discussion of the Report of the Executive Committee.
   Copies have been circulated by mail to all members.

3. Finance
   (a) Presentation and discussion of the Financial Report.
   Copies have been circulated by mail to all members.

   (b) Election of Financial Auditors to examine the Financial Report.

   (c) In accordance with Netherlands law, a Financial report is to be presented to a meeting of members within six months of the end of the fiscal year, unless the General Assembly agrees to extend this period. The Assembly is invited to extend this period until the next ordinary Session.

4. Appointment of Officers and Council Members.
   According to art. 6 of the Statues, Officers and Council Members are to be appointed by the General Assembly at each ordinary Session from a binding nomination. The binding nomination which was decided by all individual members through a mail vote, is as follows:

   President-Elect : G. Kulldorff (Sweden)
   Vice President : B. Afonja (Nigeria)
   Li Chengrui (China)
   W.R. Van Zwet (Netherlands)

   Council Members (1987 - 1991):

   L. Biggeri (Italy)
   M.A. Korolev (USSR)
   T.A. Mijares (Philippines)
   K. Neumann (DDR)
   M.H. Regier (Lebanon)
   G. Théodore (France)
   Wang Shou Ren (China)
   V.J. Yohai (Argentina)

5. Announcement of the composition of the Nominations Committee.

6. Determination of the number of vacancies in the 1988 and 1989 elections of ordinary members.

Meeting II - Tuesday afternoon, 15 September 1987

1. Future Sessions

2. Presentation of the Report of the Financial Auditors.

3. Report by Committees of the Institute:
   (a) Programme Committee for the 46th Session
   (b) Statistical Education Committee
   (c) Publications Committee
   (d) Other Committees

4. Reports by the Presidents of Sections

5. Any Other Business

NOTES:

1. Full participation in discussions and voting in the meetings of the ISI General Assembly is reserved for honorary, ordinary and *ex officio* members of the ISI.

2. *Ex officio* members entitled to participate fully in the meetings of the General Assembly are those included on the list posted near the ISI offices in the Conferences building, plus any who have presented their official credentials in writing to the ISI offices not later than 24 hours before the meeting.

3. Members of Sections who are interested in the proceedings of the General Assembly are welcome to attend as observers.

Procedural Guidelines for General Assembly Meetings

1. The time allotted to the introduction of a business item or the presentation of a report shall be determined by the presiding officer. Written reports and other documents that have been circulated before the meeting will not normally be read from the platform.

2. Before speaking, a member* must be recognized by the presiding officer, and the speaker's name should be announced. When necessary in order to conserve time the presiding officer may determine time limits for speakers. Any member wishing to make a first contribution to a discussion shall have priority over all who have already spoken.

3. Speakers may use the English or French language (and any other Conference language for which simultaneous interpretation is available). In order to facilitate simultaneous interpretation, a speaker not using the language of the previous speaker should first announce his change of language and then pause briefly before his contribution. Speakers must speak slowly and always into the microphone.

4. Any member of ISI may present a motion (i.e. a proposal for decision); this will be considered only if it is seconded (i.e. supported) by another ISI member.

5. Any member of ISI may move an amendment (i.e. a modification) to a motion or to a previously proposed amendment; it will be considered only if it is seconded.

6. Voting on amendments shall take place in the reverse order of their presentations. When all the amendments to a motion have been voted upon, the motion together with those amendments that have been carried shall be voted upon.

7. A motion to discontinue the discussion of a business item or motion shall (if seconded) be voted upon immediately without discussion.

8. A motion to postpone a business item or motion, for consideration at a later stage of the meeting or at a specified subsequent meeting, shall (if seconded) be discussed and voted upon before further discussion of the business item or motion.

9. Any member wishing to request that an item be included in the agenda should inform the Secretary/Treasurer at least 48 hours before the scheduled meeting of the General Assembly.

10. Full discretion in the interpretation of these guidelines and in the conduct of business shall rest with the presiding officer.

* member = honorary, ordinally, *ex officio* member of International Statistical Institute

CHANGES IN SCIENTIFIC PROGRAMME

9 Sept. (Wed.) Morning

Topic 140 Room H2 (Seiun II)

Added: 145.6 P.L. Bupta, R.D. Gupta
Relative error in systems reliability. (p. 149)

Poster Meeting 1 Room C (Ohtori-Nishi)

Transferred: 1. G. Consonni (Poster Meeting 3 - 14 Sept. (Mon.) Morning)
A predictive approach to symmetry hypotheses testing.

Cancelled: 6. F. Malek
A study of ridge regression.

9 Sept. (Wed.) Afternoon

Topic 115 Room G (Yakumo)

Changed: Chairperson T. Yanagimoto

Cancelled: 115.1 E.J. Harner
Designing a matched case-control study of occupational fatalities.

Topic 119 Room I (Ryoun)

Added: 120.1 R.C. Gupta, R.A. Albanese
Estimation of relative risk in epidemiological studies. (P.151)

Topic 122 Room H1 (Seiun I)

Cancelled: 122.5 H. Mehdizadeh-Ashrafi
Population migration problem in sample cities in Iran.

ADMINISTRATIVE MEETINGS

The following meetings will be held during the lunch break (12:00 - 14:00).

	Room
9 September (Wed.)	
ISI Programme Committee	P (Toki)
ISI Ad Hoc Committee on the Provision for Statistics in the Life Sciences*	I (Ryoun)
Bernoulli Society Council	H1 (Seiun I)
IAOS Executive Committee	L (Chidori)
IASC Council	H2 (Seiun II)
IASS Programme Committee	J (Kujyaku)
10 September (Thur.)	
ISI Publications Committee	H2 (Seiun II)
ISI Research Centre Steering Committee	P (Toki)
Bernoulli Society Programme Committee	M Shirasagi)
IAOS Programme Committee	L (Chidori)
IASC Programme Committee	K (Hibari)
IASS Council	Hl (Seiun I)
11 September (Fri.)	
ISI Programme Co-ordinating Committee	H1 (Seiun I)
ISI Nominations Committee	P (Toki)
ISI Statistical Education Committee	H2 (Seiun II)
Bernoulli Society General Assembly (12:30 - 14:30)	A (Ohtori-Higashi)
IAOS General Assembly	F (Zuiun II & III)
14 September (Mon.)	
ISI Programme Co-ordinating Committee	P (Toki)
ISI Ad Hoc Committee on the Provision for Statistics in the Life Sciences*	I (Ryoun)
Bernoulli Society Council	H1 (Seiun I)
IAOS Executive Committee	L (Chidori)
IASC General Assembly	A (Ohtori-Higashi)
IASS General Assembly	B (Ohtori-Naka)

15 September (Tues.)

ISI Publications Committee	I (Ryoun)
ISI Nominations Committee	G (Yakumo)
ISI Statistical Education Committee	H2 (Seiun II)
ISI Research Centre Steering Committee	P (Toki)
IAOS Programme Committee*	L (Chidori)
IASS Council	H1 (Seiun I)

16 September (Wed.)

IAOS General Assembly	F (Zuiun II & III)
IASC Council	H2 (Seiun II)

*Newly added to the administrative meetings listed in the "Outline of the Session Schedule" in the Programme (pp. 8-13)

OTHER INFORMATION

EMERGENCY CALLS

In case of emergency, please call ANA Hotel Tokyo, (505)4230, 4231 or 4202. From guest rooms in ANA Hotel Tokyo, dial extention 1.

LUNCH AT ADMINISTRATIVE MEETINGS

The ANA Hotel Tokyo will serve sandwiches and coffee for the participants (¥2,000 per person) at administrative meetings to be held during the lunch break (excluding the General Assemblies of the Sections).

Chairpersons of the meetings where the lunch will be served are advised to make reservations by calling the NOC Secretariat (Mr. K. Makino, ext. 5491) by 16:00 the day before each meeting. Please pay in cash at the meeting.

MAIL SERVICE

Mail service will be available at the Mail Service Desk in the B1 Lobby from 11:00 to 18:00 Monday through Friday and 9:30 to 12:30 Saturday. (No service on Sunday, 13 September.)

SNAPSHOTS

Commercial snapshots will be taken on various occasions and will be displayed in Room C (Ohtori-Nishi) during the Session. Detailed information will be available in the same room.

TEA CEREMONY

Participants and accompanying persons are invited to the tea ceremony which will take place Friday, 11 September (10:00 - 12:00 ; 13:00 - 15:00) in the Hospitality Corner in Room C (Ohtori-Nishi). Experts from the Urasenke School of Tea will demonstrate the traditional tea ceremony which was completed in its present form by Sen Rikyu in the 16th century.

Tea and sweets will be served for all the guests.

JAPANESE TRADITIONAL CRAFT

An exhibition of *kimekomi-ningyo*, kimono clad wooden dolls made in the traditional *kimekomi* technique, will be held by the Mataro Doll Craft Academy in the Hospitality Corner in Room C (Ohtori-Nishi) from 10 to 14 September.

A gathering for learning *kimekomi* craft will also be held in the Hospitality Corner on 14 September, from 14:00 to 16:00. Participants will be given instruction from teachers of the Academy and may keep their creations as souvenirs. Please get detailed information and make reservations in the Hospitality Corner.

CHANGE IN SOCIAL EVENTS

AP2: The technical visit to NTT Kasumigaseki Communuication Center on ~~8~~ 14 September has been cancelled (~~15~~ 9 September only).

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Réglements concernant le Bulletin quotidien

Le Bulletin quotidien sera publié du lundi au samedi pendant la durée de la Session du 8 au 16 septembre 1987.

Des copies de ce bulletin seront disponibles à 8 heures tous les matins, à l' exception du dimanche, au Bureau du Bulletin quotidien et au Bureau d' information au sous-sol B1.

Ce Bulletin contient les modifications apportées aux programmes des réceptions et des excursions ainsi que toutes les communications pouvant intéresser les participants pendant la tenue de la Session.

Les participants désirant publier des annonces dans le Bulletin quotidien devront soumettre des copies de ces annonces jusqu'à 15 heures 30 (13 heures le samedi) au bureau du Secrétariat CNO de la salle E (Zuiun I) au sous-sol B1.

Les copies devront être dactylographiées ou écrites clairement en anglais et/ou en français et seront publiées dans la langue dans laquelle elles auront été présentées.

Les décisions concernant l'introduction de ces annonces dans le Bulletin ainsi que la forme de leur présentation seront prises par le Bureau permanent de l'IIS et le Comité National d'Orgnisation.

資料 7

論文 提出者 名單

INVITED PAPERS (Authors and Titles)
COMMUNICATIONS INVITÉES
(Auteurs et Titres)

CONTENTS–MATIÈRES

AUTHORS / AUTEURS		TITLES / TITRES	TOPIC CODE
DRJUCHIN, V.	(U.S.S.R.)	Trends in national accounting and their effect on links between SNA and MPS.	1.5
Du MOUCHEL, W. H.	(U.S.A.)	Experience with a statistics advisor for industrial scientists and engineers.	28.1
ERICKSON, P.	(U.S.A.)	See FEINLEIB, M.(U.S.A.)	
EVERITT, B. S.	(U.K.)	Graphical displays of complex data - scientific tools or simply art for art's sake?	16.1
FAMOYE, K. F.	(Canada)	Interval estimation for the restricted generalized Poisson distribution.	7.3
FAY, R. E.	(U.S.A.)	Small domain estimation through components of variance models.(not yet received)	29.1
FEINLEIB, M.	(U.S.A.)	Using large-scale national health and nutrition status surveys for evaluating population health levels: the NCHS experience.	4.3
FISHER, N. I.	(Australia)	Graphical methods in statistics: current and prospective views.	16.3
FITZPATRICK, B. M.	(Australia)	Experience with ADABAS at the Australian Bureau of Statistics.	20.1
FORSMAN, G.	(Sweden)	See ANDERSSON, C.(Sweden)	
FULLER, W. A.	(U.S.A.)	Survey variance computations on the personal computer.	10.2
GALE, W. A.	(U.S.A.)	Student: a tool for constructing consultation systems in data analysis.	15.1
GEMAN, S,	(U.S.A.)	Statistical methods for tomographic image reconstruction.	21.1
GIOMMI, A.	(Italy)	See BIGGERI, L.(Italy)	
GONZÂLEZ MARTÍN, F.	(Cuba)	AI and expert systems in statistics: perspectives of using logic programming in statistical data processing. The Cuban experience.	15.2
GREEN, P. J.	(U.K.)	Recursive methods in image processing.	22.1
GRENANDER, U.	(Sweden)	Mathematics motivated by emergence of different kinds of very powerful computers.	17.1

AUTHORS / AUTEURS		TITLES / TITRES	TOPIC CODE
LEAVER, S. G.	(U.S.A.)	Item-outlet sample redesign for the 1987 US consumer price index revision.	12.3
LIU, L.-M.	(U.S.A.)	Integrated time series analysis and forecasting using the SCA statistical system.	19.3
LUO JIYU,	(China)	Problems in constructing the regional model life tables of Sichuan Province in China based upon China's third population census data and methods to solve these problems.	17.2
LYBERG, L.	(Sweden)	The advance of statistical theory and methodology and their uses in official statistics.	1.3
MADSEN, F.	(Denmark)	Some differences in the quality of data obtained by telephone- and in person interviews.	13.1
MALINVAUD, E.	(France)	Des statistiques aux projections.	6.2
MALLOWS, C. L.	(U.K.)	Some principles of data analysis.	26.1
MANDISHONA, G.	(Zimbabwe)	See TIN, M.(Burma)	
MARGOLIN, B. H.	(U.S.A.)	Short-term tests for genetic toxicity: the statistical imperative.	24.3
MARTENS, H.	(Norway)	Multivariate calibration: combining harmonies from an orchestra of instruments into reliable predictors of chemical composition.	30.2
MATSUDA, Y.	(Japan)	Historical development of Japanese statistics.	2.1
McCLURE, D. E.	(U.S.A.)	See GEMAN, S.(U.S.A.)	
MEEGAMA, A.	(Sri Lanka)	Measurement and utilization of health related indicators: historical and contemporary experience in Sri Lanka. (not yet received)	4.1
MKAI, C. P. B.	(Tanzania)	The community based health information system being established in Tanzania.	4.2
MOHN, E.	(Norway)	See HJORT, N. L.(Norway)	
MORIN, J.-P.	(Canada)	See BINDER, D. A.(Canada)	
MOSTELLER, F.	(U.S.A.)	Compensating for radiation-related cancers by probability of causation or assigned shares.	31.3

AUTHORS / AUTEURS		TITLES / TITRES	TOPIC CODE
NARAIN, P.	(India)	Measuring change in agricultural surveys.	8.1
NATHAN, G.	(Israel)	The use of linear models and misclassification models to assess response error effects of mode of data collection.	13.2
NICHOLSON, W. L.	(U.S.A.)	Some computing environments for data analysis.	26.3
OHSUMI, N.	(Japan)	See YAJIMA, K.(Japan)	
OLDFORD, R. W.	(Canada)	An object oriented approach.(not yet received)	28.2
OLSSON, L.	(Sweden)	See JAMBWA, M.(Zimbabwe)	
PARK, S. H.	(Korea)	The use of computers for statistical activities in developing countries.	18.3
PETERS, S. C.	(U.S.A.)	See OLDFORD, R. W.(Canada)	
PIERCE, D. A.	(U.S.A.)	Developments in cohort analysis, with application to radiation induced cancer.	31.2
PREGIBON, D.	(U.S.A.)	See MALLOWS, C. L.(U.K.)	
PRESTON, D. L.	(U.S.A.)	See PIERCE, D. A.(U.S.A.)	
RABBANI, A. K. M.G.	(Bangladesh)	Application of micro-computers in the field of statistics - Bangladesh experience.	27.2
RAO, C. R.	(U.S.A.)	Strategies of data analysis.	26.2
RAO, J. N. K.	(Canada)	Methods for standard errors and confidence intervals from sample survey data: some recent work.	10.1
RAPAPORT, E.	(Sweden)	See LYBERG, L. E.(Sweden)	
RUST, K.	(U.S.A.)	Practical problems in sampling error estimation.	10.3
SAHIB, M. A.	(Fiji)	Development of statistical capability within official statistical agencies in the ESCAP region.	18.1
SAKAI, H.	(Japan)	Several architectures for recursive least squares filtering.	22.3
SANCHEZ, E.	(U.S.A.)	Chemometrics in the future: higher order tensors.	30.3

AUTHORS / AUTEURS		TITLES / TITRES	TOPIC CODE
SARDANA, M. G.	(India)	Present and future trends of collecting, processing and utilization of official statistics.	1.4
SCHNELL, D.	(U.S.A.)	See FULLER, W. A.(U.S.A.)	
SJÖSTRÖM, M.	(Sweden)	See WOLD, S.(Sweden)	
SKINNER, C. J.	(U.K.)	See HOLT, D.(U.K.)	
SMITH, A. F. M.	(U.K.)	Strategies for modelling, detecting and acommodating outliers in time series.(cancelled)	23.1
SOLOMON, L.	(U.S.A.)	Simulating the process: survey training at the Census Bureau.(not yet received)	14.1
SPJØTVOLL, E.	(Norway)	Application of some empirical Bayes methods to small area statistics.	29.2
SRIVASTAVA, A. K.	(India)	See NARAIN, P.(India)	
SULLIVAN, G.	(U.S.A.)	See FULLER, W. A.(U.S.A.)	
TAQQU, M. S.	(U.S.A.)	See DEHLING, H.(U.S.A.)	
THOMSEN, I. O.	(Norway)	See SPJØTVOLL, E.(Norway)	
TIAO, G. C.	(U.S.A.)	Analysis of tropospheric and stratospheric ozone data for trend detection.(not yet received)	17.3
TIN, M.	(Burma)	Master sample used in national household surveys of Zimbabwe.	9.2
TITTERINGTON, D.M.	(U.K.)	See GREEN, P. J.(U.K.)	
TORENE, L. G.	(U.S.A.)	See TORENE, R.(U.S.A.)	
TORENE, R.	(U.S.A.)	The practical side of using master samples: the Bangladesh experience.	9.1
TREWIN, D. J.	(Australia)	Estimation of trends and time series models from continuing surveys.	8.2
TSUJIMURA, K.	(Japan)	An appraisal of the Japanese economic statistical data from viewpoints of user: measurements of sectoral output and inputs.	2.4
TURNER, T. R.	(Australia)	See CAMERON, M. A.(Australia)	
VERVAAT, W.	(Netherlands)	Properties of general self-similar processes.	25.1

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CONTENTS–MATIÈRES