Economic Commission for Latin America and the Caribbean

ECLAC SUBREGIONAL HEADQUARTERS FOR THE CARIBBEAN

Report of the expert group meeting on statistical disclosure control for Caribbean census tables

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Economic Commission for Latin America and the Caribbean
Subregional Headquarters for the Caribbean

Expert group meeting on statistical disclosure control
for Caribbean census tables

Virtual meeting, 10 November 2020

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REPORT OF THE EXPERT GROUP MEETING ON STATISTICAL DISCLOSURE CONTROL FOR CARIBBEAN CENSUS TABLES

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CONTENTS

A. CONCLUSIONS AND RECOMMENDATIONS

1. There was a consensus that statistical disclosure control is an important consideration within the census process, and that both the study and the panellists' presentations provided valuable information which would be of great help to statistical offices in evaluating how they should approach the issue in the current census round.

2. The meeting participants recognized that all methods of statistical disclosure control have advantages and disadvantages and that individual census statisticians needed to give careful consideration to the proposed methods and their appropriateness in given national circumstances.

3. There was also a recognition of the benefits of post-tabular perturbation, which include unbiasedness and the low level of perturbation that is necessary to protect the data. However, concerns were expressed about the loss of additivity of census tables and the possible public reaction to the publication of non-additive tables.

4. It was agreed that if post-tabular perturbation methods were to be adopted, there would be a need to educate users of census data on these procedures for them to understand why tables were non-additive. It was noted that this need for education of users is part of a wider issue of statistical literacy, which statistical offices and international development partners are also seeking to address.

5. In preparation for national censuses, meeting participants welcomed continued dialogue on the implementation of disclosure control methods.

B. ATTENDANCE AND ORGANIZATION OF WORK

1. Place and date of the expert group meeting

6. The Economic Commission for Latin America and the Caribbean (ECLAC) subregional headquarters for the Caribbean convened a virtual expert group meeting to discuss the study entitled "Statistical disclosure control for Caribbean census tables". This meeting took place online on 10 November 2020.

2. Attendance

7. The meeting was attended by representatives of statistical offices from Caribbean member States and associate members as well as Canada and Germany. Also, in attendance were representatives from the United Nations Population Fund (UNFPA), the Inter-American Development Bank (IDB), the Partnership in Statistics for Development in the 21st Century (PARIS 21) and the University of the West Indies (UWI). Furthermore, representatives from both ECLAC headquarters and subregional headquarters for the Caribbean were present.

8. The meeting was chaired by the Deputy Director of ECLAC subregional headquarters for the Caribbean.

3. Documentation

9. The study on "Statistical disclosure control for Caribbean census tables" prepared by the Population Affairs Officer of ECLAC subregional headquarters for the Caribbean, was the reference document for the meeting.

4. Agenda

1. Opening of the meeting
2. Presentation of the study: "Statistical disclosure control for Caribbean census tables"
3. Panel presentations: perspectives on statistical confidentiality for census tables
4. Discussion
5. Conclusion

C. SUMMARY OF PROCEEDINGS

1. Opening of meeting

10. The Deputy Director of ECLAC subregional headquarters for the Caribbean welcomed all the participants and gave an overview of the objectives of the study being presented. He indicated that over recent years, ECLAC has been working with statistical offices in the Caribbean to make census data more available through the REDATAM software (Retrieval of Data for Small Areas by Microcomputer). Through these collaborations, he noted that it became increasingly evident that better methods of statistical disclosure control were needed to safely release detailed and disaggregated census tables. He suggested that the fact that Caribbean statistical offices are not using specific methods of disclosure control has led to relatively strong restrictions on the availability of census data in many Caribbean countries. ECLAC's study on "Statistical disclosure control for Caribbean census tables" was initiated in order to address this issue.

11. The study reviewed disclosure control methods that have been implemented in North America, Europe, Australia and New Zealand and argues that if implemented in the subregion, these methods could facilitate the publication of more detailed and disaggregated census data both through published reports and online applications built using the REDATAM software. These methods are applicable not only to statistical offices in the Caribbean but also to those in Latin America and REDATAM users in other parts of the world.

12. The Deputy Director added that the COVID-19 pandemic is likely to delay the 2020 round of censuses in some countries but this does provide an opportunity to reconsider the approach to statistical disclosure control. He highlighted that Caribbean statistical offices are very aware of disclosure risks and the need to protect the confidentiality of individual and household level microdata and, as such, it is an opportune time to discuss the study and its proposals. The study reviewed international best practice; tested and evaluated selected methods; and proposes methods which could be implemented in the REDATAM software.

2. Presentation of the study "Statistical disclosure control for Caribbean census tables"

13. The Population Affairs Officer of ECLAC subregional headquarters for the Caribbean presented the study on "Statistical disclosure control for Caribbean census tables". The research, he reiterated, grew out of work that had been carried out mainly over the last five years to support Caribbean statistical offices in making their census data available online through REDATAM. He highlighted that Caribbean statisticians face a challenge in the dissemination of disaggregated data due to the small size of national populations. He also explained that the study was primarily concerned with statistical disclosure control methods for tabular census data which would facilitate dissemination of more granular and disaggregated information. Statistical disclosure control for census microdata is a somewhat separate issue addressed by a previous ECLAC study.[1]

[1] ECLAC (2016), "Dissemination of Caribbean census microdata to researchers: including an experiment in the anonymization of microdata for Grenada and Trinidad and Tobago", (LC/L.4134), Santiago, Chile, February.

14. He explained that there are methods used by statistical offices in North America, Europe, Australia and New Zealand that could help Caribbean statistical offices to safely disseminate more census data tables. Disclosure control is about comprise between conflicting imperatives: the obligation to disseminate as much useful census data to users as possible, while minimizing to an acceptable level any risk that information about individuals is disclosed. All methods tend to have advantages and disadvantages and there are no perfect solutions. Statistical offices have an obligation to protect personal data and where there are disclosure risks, they need to err on the side of caution.

15. The literature on statistical disclosure control has formalized the concept of disclosure, distinguishing between identification; attribute disclosure; group attribute disclosure and disclosure by differencing. Disclosure control methods for tabular data are concerned primarily with small cell counts (or implied small cell counts which can be derived by differencing). Analysts of census data often require multidimensional cross-tabulations, yet these are often not published or not available because they contain a high proportion of small cell counts.

16. The Population Affairs Officer described current methods utilised by statistical offices in different countries. He stated that there were two types of methods: perturbative and non-perturbative. Non-perturbative methods, also referred to as data reduction methods, are what statistical offices do almost by default, essentially choosing whether or not to publish data. Alternatively, perturbative methods introduce a small amount of random variation, and therefore uncertainty about the true original data values, thereby enabling the publication of data which would otherwise remain unpublished. Perturbative methods are divided into pre- and post-tabular methods.

17. The most common pre-tabular method is record swapping which involves taking a small percentage of the microdata records and swapping the geographic codes (it was applied in recent censuses in the United States, United Kingdom and several other European countries). It provides some protection against disclosure risk but does not remove small cell counts from the data. This level of protection may be sufficient for standard census tables but is not sufficient, at least on its own, in the context of an online flexible table generator.

18. With post-tabular methods, the data are tabulated and then the data in the cells of the table are perturbed either through random rounding or the addition of additive noise.

19. He underscored that Caribbean and Latin American census data are widely disseminated through flexible online table generators built using REDATAM. Post-tabular methods are therefore more suitable because of the stronger protection that they provide.

20. The United States, he mentioned, is shifting to a method called differential privacy that is not applicable to the Caribbean or Latin America because of the region's use of long form censuses. Differential privacy can be thought of as a more sophisticated version of the post-tabular methods.

21. Following his review of the methods used in North America, Europe, Australia and New Zealand, the Population Affairs Officer highlighted that there are various perturbation schemes that can be utilised, with slightly different probability distributions. He stated that the range of perturbation (or rounding adjustments) is normally between plus or minus two which would be considered relatively light perturbation and plus or minus four which would be considered relatively heavy perturbation.

22. The Population Affairs Officer indicated that cell perturbation and random rounding could be built into REDATAM. Both the cell perturbation and random rounding methods involve giving up a small degree of accuracy and strict additivity of tables. He stated that countries currently using post-tabular methods accept the non-additivity as they consider that the advantages of the methods outweigh the disadvantages.

Giving up strict additivity allows you to release much more detailed and disaggregated census tables, which is what data analysts really need.

23. The Population Affairs Officer concluded the presentation by suggesting that the methods presented in the study are potentially relatively easy to implement and would constitute a practical statistical disclosure control solution that could help to significantly expand the availability of detailed census tables in the subregion.

3. Panel presentations: Perspectives on statistical confidentiality for census tables

24. This segment of the meeting was chaired by the Coordinator of the Statistics and Social Development Unit of ECLAC subregional headquarters for the Caribbean. He introduced the five panellists: Jean-Louis Tambay, Researcher, Statistics Canada, Project for the Regional Advancement of Statistics in the Caribbean (PRASC); Sarah Giessing and Tobias Enderle, Researchers, Federal Statistical Office of Germany (Destatis); Leesha Delatie-Budair, Deputy Director General, Statistical Institute of Jamaica and Ari Silva, REDATAM Development Centre, Latin American and Caribbean Demographic Centre (CELADE), Population Division of ECLAC.

Panellist 1: Jean-Louis Tambay, Researcher, Statistics Canada and the PRASC project

25. The Researcher from Statistics Canada emphasized that statistical offices must protect the confidentiality of respondent information in order to avoid loss of trust in official statistics which could lead to a drop in census and survey response rates. He suggested that there are two types of disclosure: accidental or intentional. Accidental disclosure is where there is spontaneous recognition of a public figure, friend or relative. Additionally, there can be self-identification which is problematic because if people recognize themselves in the data they can complain. Intentional disclosure is where a hacker or journalist, for instance, searches the data to expose individuals, perhaps through matching them to external databases.

26. The Researcher presented two strategies to combat statistical disclosure: additive noise and random rounding. He suggested that these strategies are an efficient way to protect census data. He added that random rounding is more visible.

27. The Researcher stated that in his opinion perturbation of plus or minus one or two does not provide sufficient protection. With online query systems, there is an increased likelihood of accidental disclosure because with an increased volume of data being released, there are more opportunities for hackers. Disclosure, he stated, can happen even if some type of perturbation method is implemented. He indicated that household data presents specific risks, for example households where all members share a rare ethnicity. One solution he cited was to provide less details on ethnicity for rarer groups or for other visible characteristics especially at the regional level. Another solution is to suppress counts for these visible characteristics.

28. In addition to post-tabular methods, the panellist indicated that you must have a multilevel approach. He emphasized that, although the method is efficient, it is not infallible. Post-tabular perturbation, he stated, must be supplemented with other approaches especially below the national level. Other approaches include greater restrictions and limits on the number of table dimensions. He closed his presentation with some general advice:

- Ensure that user expectations are managed and data requests are handled efficiently
- Consider query monitoring which can also help to prevent attacks
- Adopt a holistic approach (consider all data products that are released)

Panellist 2: Sarah Giessing and Tobias Enderle, Federal Statistical Office of Germany, Destatis

29. The panellists from the Federal Statistical Office of Germany gave an overview of the process of selecting an appropriate disclosure control method for the 2021 German census. They started by highlighting that there are many different disclosure control methods: some work by information reduction and some work by perturbation, that is, creating some uncertainty about the true value of the count.

30. They stated that in selecting a disclosure control method for the German census in 2021, certain requirements were defined in order to evaluate methods: there should be no small frequencies in protected tables; the method must provide protection against disclosure by differencing; and there must be consistency across linked tables. In addition, the method should provide protection in a context where users are able to define their own tables. Cell perturbation was the method that met these criteria.

31. Looking back at the 2011 German census, they recalled that a method of pre-tabular disclosure control called SAFE was applied. This method could result in relatively larger differences between the original and protected tables.

32. The representatives of Destatis described algorithms which can restore additivity to tables of perturbed data. They described their testing of the Controlled Tabular Adjustments Method to assess if it provided a practical and feasible solution to the problem of non-additivity, albeit at the cost of consistency between tables. They found that while the algorithm can restore additivity for some tables, it is not sufficiently dependable to be used for routine production of census tables. They suggested that cell perturbation gives high accuracy and consistency across tables. Even when it is possible to restore additivity for some tables, consistency between tables is lost.

33. To summarize, after using pre-tabular perturbation for the 2011 census in Germany, the cell perturbation methodology will be adopted for the 2021 census. It has been decided that they will accept the non-additivity of the tables in order to have full control of the noise distribution, and thus the higher level of accuracy and exact consistency across tables.

Panellist 3: Leesha Delatie-Budair, Deputy Director General, Statistical Institute of Jamaica (STATIN)

34. The Deputy Director General of the Statistical Institute of Jamaica (STATIN) described Jamaica's approach to disclosure control for both microdata and for tabular data.

35. Disclosure control for microdata, she stated, involved the recoding of the principal identification variable. For the 2011 Jamaican census, aspects of the identification variable were removed while preserving the integrity of the data for analysis. Also removed from tables were sensitive variables like names and contact information. Further, the string variables were recoded to ensure that there were no highly specific responses that could lead to the identification of respondents. The Statistical Institute of Jamaica, she stated, makes some microdata available for research purposes, subject to suppression of variables with low frequency counts and some data aggregation.

36. The Deputy Director shared the following thoughts on the ECLAC study: "I found it to be quite interesting and thought provoking. It is exactly what we needed at this point in time, in terms of initiating the discussion." She added that cell perturbation and rounding are unbiased and not subjective because of the probabilistic measures being employed. There is flexibility with implementation and if it is integrated into the REDATAM software it would be much easier to implement.

37. She detailed some disadvantages to the method proposed in the study. Firstly, non-additivity: the Deputy Director emphasized that the challenge here is with communicating this to the data users. Secondly, she suggested that STATIN would need to consider how disclosure control methods applied to tabular data affected their consistency with results based on microdata which had been released to researchers. She questioned: "How do we balance the results coming out of the microdata that we have made available and the results coming out of post-tabular disclosure control methods?"

38. She commented that the differential privacy approach used by the United States Census Bureau for their 2020 census is interesting but there are time constraints and STATIN do not have the capacity to do the full research into differential privacy.

39. She concluded by emphasizing that the pros and cons of disclosure control methods must be considered. Additionally, it is important to consider effectively communicating the method chosen so as not to undermine public trust in the competence of the statistical office.

Panellist 4: Ari Silva, Consultant, REDATAM Development Centre, Latin American and Caribbean Demographic Centre (CELADE), Population Division of ECLAC

40. The Consultant of the REDATAM Development Centre described the historical evolution of the REDATAM software. He described the main features of the software: that it is user-friendly, free and stores data efficiently; produces tabulations rapidly and efficiently (1 million records per second); enables users to customize tables, graphs and thematic maps; and provides a command language for aggregated data generation.

41. He outlined the main goals of the next generation of the REDATAM software which were to improve disclosure control by the introduction of new methods to prevent confidential information contained in microdata being disclosed through tables; improved encryption of the microdata; and program accessibility so that programmers will be able to develop plug-ins and independent modules to customize access to REDATAM databases.

4. Discussion

42. The Deputy Director of the ECLAC subregional headquarters for the Caribbean questioned if there were any protocols or ethical considerations involved in allowing specialized agencies, universities or think tanks to have a closer look at the information in a way that does not allow them to identify individuals but enables them to carry out more granular and deeper analyses.

43. The representative from The University of the West Indies confirmed that specialized agencies, universities, and think tanks are able to obtain anonymized microdata from some statistical offices that make microdata available to users through a licensing agreement. Key identifiers and other identifying information are stripped before release. Additionally, the licensing agreement indicates that data provided are for academic research or for teaching and also sets out the obligations of the data recipient, for example relating to safe storage and publication of their analyses.

44. In responding to the Deputy Director of STATIN's concern about the potential for inconsistencies between perturbed tabular data and the results that researchers produce using microdata, the Population Affairs Officer remarked that the situation in Jamaica is somewhat unusual as STATIN makes full-sample microdata available while most other Caribbean statistical offices do not, except in very limited circumstances. He stated that, the release of anonymized samples of microdata is the more common practice although this does present some problems for Caribbean countries. Whereas for most countries a 10 per cent anonymized sample of census records provides a very good sample for researchers on which to carry

out analysis, for small Caribbean countries a 10 per cent sample is not sufficiently large for detailed analysis. However, where countries do release samples of anonymized census records, there will be some inconsistency between tabular data and the results produced by researchers using the anonymized microdata, so this is not unusual.

45. Further, the Population Affairs Officer added that, with random rounding it is easier for users to accept the non-additivity. This is because it is very visible to users that data have been rounded and therefore, they can immediately understand why tables are not strictly additive. Those countries that have introduced post-tabular perturbation have found it to be very effective and having adopted it, have continued to use it. If the case is well made, there is no reason to think that these methods could not be applied in the Caribbean (or Latin America). Considering how these methods would facilitate the publication of much more detailed census tables, the small loss of accuracy and strict additivity of tables would be a price worth paying.

46. The Director of the Barbados Statistical Service commented that he agreed with the Deputy Director of STATIN regarding the slightly different challenges in each country, and he considered that the issue needed to be dealt with on a case by case basis.

5. Closing remarks

47. The Deputy Director and the Coordinator of Statistics and Social Development Unit of ECLAC subregional headquarters wrapped up the virtual expert group meeting, thanking the participants for their contributions. Meeting participants pledged to continue the discussion and give further consideration to disclosure control in preparation for the upcoming census round.

Annex I

List of participants

A. Member States

ANTIGUA AND BARBUDA
- Statchel Edwards, Chief Statistician, Ministry of Finance and the Economy, email: statchel.edwards@ab.gov.ag
- Rohan Anthony, Senior Statistician, Ministry of Finance and the Economy, email: rohan.anthony@ab.gov.ag
- Jabari Gordon-Toylor, Statistical Officer (a.i.), Ministry of Finance and the Economy, email: Jabari.Gordon-Toylor@ab.gov.ag

BARBADOS
- Aubrey Browne, Director (a.i.), Barbados Statistical Service, email: abrowne@barstats.gov.bb

THE BAHAMAS
- Leona Wilson, Director (a.i.), Department of Statistics, Ministry of Finance, email: leonawilson@bahamas.gov.bs
- Kim Saunders, Statistician, Department of Statistics, Ministry of Finance, email: kimsaunders@bahamas.gov.bs

BELIZE
- Lesley Cruz, Statistician II, Statistical Institute of Belize, email: lcruz@mail.sib.org.bz
- Javier Romero, Assistant Statistician I, Statistical Institute of Belize, email: jromero@mail.sib.org.bz

GRENADA
- Kishi Logie, Systems Administrator, Central Statistical Office, email: klogie1200@gmail.com

JAMAICA
- Carol Coy, Director General, Statistical Institute of Jamaica, email: ccoy@statinja.gov.jm
- Leesha Delatie-Budair, Deputy Director General, Statistical Institute of Jamaica, email: ldelatie-budair@statinja.gov.jm
- Jessica Campbell, Director of Research Design and Evaluation, Statistical Institute of Jamaica, email: jcampbell@statinja.gov.jm
- Amanda Lee, Statistician, Statistical Institute of Jamaica, email: alee@statinja.gov.jm
- Natalee Simpson, Division Director, Surveys, Field Services, Statistical Institute of Jamaica, email: nsimpson@statinja.gov.jm
- Juliet McCalla Smith, Senior Statistician, Statistical Institute of Jamaica, email: cdss@statinja.gov.jm

SAINT KITTS AND NEVIS
- Carlton Phipps, Director of Statistics (a.i.), Statistics Division, Ministry of Sustainable Development, email: juniorphipps@gmail.com
- Dorriel Tross-Phillip, Director, Statistics Department, Ministry of Finance, Nevis Island Administration, email: dphillip@niagov.com
- Karen McDonald, Statistician, Department of Statistics and Economic Planning, Ministry of Finance, Nevis Island Administration, email: karen.mcdonald@niagov.com

SAINT LUCIA
- Linn Brown, Statistician, Central Statistical Office, email: linn.brown@govt.lc
- Toney Perineau, Statistician, Central Statistical Office, email: toney.perineau@govt.lc

SURINAME
- Naomi Caupain, Field Coordinator, General Bureau of Statistics, email: n_caupain@hotmail.com

TRINIDAD AND TOBAGO
- Andre Blanchard, Director of Statistics (a.i.), Central Statistical Office, Ministry of Planning and Sustainable Development, email: cso.statistics@gmail.com; andre.blanchard@statistics.gov.tt

B. Associate members

ARUBA
- Desiree Helder, Director (a.i.) Central Bureau of Statistics, email: dhelder@cbs.aw

BRITISH VIRGIN ISLANDS
- Raymond Phillips, Director, Central Statistics Office, email: rphillips@gov.vg
- Michael Malone, Deputy Director, Central Statistics Office, email: mimalone@gov.vg

MONTSERRAT
- Simmone Fenton, Statistician, Statistics Department, Ministry of Finance and Economic Management, email: fentonms@gov.ms

C. United Nations Funds and Programmes

United Nations Population Fund (UNFPA)
- Andre Richards, Policy/Program Analyst, Sub-Regional Office for the Caribbean, email: arichards@unfpa.org

D. Organizations

Inter-American Development Bank (IDB)
- José Antonio Mejía Guerra, Modernization of the State Lead Specialist, email: joseam@iadb.org
- Jason Wilks, Sector Specialist - Public Management, Inter-American Development Bank, email: jwilks@iadb.ord

E. Other statistical offices and related entities

Federal Statistical Office of Germany (Destatis)
- Sarah Giessing, Senior Researcher, Mathematical Statistical Methods Department, email: Sarah.Giessing@destatis.de
- Tobias Enderle, Researcher, Mathematical Statistical Methods Department, email: Tobias.Enderle@destatis.de

Statistics Canada
- Tracy Tabuchi, Project Coordinator, Project for the Regional Advancement of Statistics in the Caribbean (PRASC), email: tracy.tabuchi@canada.ca
- Jean-Louis Tambay, Researcher, Project for the Regional Advancement of Statistics in the Caribbean (PRASC), email: jean-louis.tambay@canada.ca

The Partnership in Statistics for Development in the 21st Century (PARIS21)
- Johannes Jütting, Manager, email: johannes.jutting@oecd.org

F. Academic institutions

The University of the West Indies (UWI)
- Richard Leach, Manager, Derek Gordon Databank, Sir Arthur Lewis Institute of Social and Economic Studies (SALISES), UWI Mona Campus, email: richard.leach@uwimona.edu.jm

G. Secretariat

Economic Commission for Latin America and the Caribbean (ECLAC)
- Rolando Ocampo, Director, Statistics Division, email: rolando.ocampo@cepal.org
- Xavier Mancero, Chief, Social Statistics Unit, Statistics Division, email: xavier.mancero@cepal.org
- Lenin Aguinaga, Information Systems Officer, REDATAM Development Centre, Latin American and Caribbean Demographic Centre (CELADE) – Population Division of ECLAC, email: lenin.aguinaga@cepal.org
- Ari Silva, Consultant, REDATAM Development Centre, Latin American and Caribbean Demographic Centre (CELADE) – Population Division of ECLAC, email: arinsilvabr@gmail.com

ECLAC subregional headquarters for the Caribbean
- Dillon Alleyne, Deputy Director, email: dillon.alleyne@eclac.org
- Abdullahi Abdulkadri, Coordinator, Statistics and Social Development Unit, email: abdullahi.abdulkadri@eclac.org
- Catarina Camarinhas, Social Affairs Officer, Statistics and Social Development Unit, email: catarina.camarinhas@eclac.org
- Francis Jones, Population Affairs Officer, Statistics and Social Development Unit, email: francis.jones@eclac.org
- Michael Hendrickson, Economic Affairs Officer, Economic Development Unit, email: michael.hendrickson@eclac.org
- Amelia Bleeker, Associate Programme Management Officer, Caribbean Knowledge Management Centre, email: amelia.bleeker@eclac.org
- Candice Gonzales, Research Assistant, Statistics and Social Development Unit, email: candice.gonzales@eclac.org
- Aurélie Quiatol, Meeting Services Assistant, Programme Support Unit, email: aurelie.quiatol@eclac.org
- Rossano Thompson, Senior Programme Management Assistant, Caribbean Knowledge Management Centre, email: rossano.thompson@eclac.org
- Colleen Skeete, Programme Management Assistant, Statistics and Social Development Unit, email: colleen.skeete@eclac.org
- Shirelle Floyd, Consultant, Statistics and Social Development Unit, email: shirellefloyd@gmail.com

Annex II

Programme

09:30 – 10:00	**Opening of the Meeting** Welcome remarks Dillon Alleyne, Deputy Director, ECLAC subregional headquarters for the Caribbean
	Presentation: Statistical Disclosure Control for Caribbean Census Tables Francis Jones, Population Affairs Officer, ECLAC
10:00 – 10:50	**Panel: Perspectives on statistical confidentiality for census tables** Moderator: Abdullahi Abdulkadri, Coordinator of Statistics and Social Development Unit, ECLAC Jean-Louis Tambay, Researcher, Statistics Canada and the PRASC project Sarah Giessing/Tobias Enderle, Destatis (Federal Statistical Office of Germany) Leesha Delatie-Budair, Deputy Director General, Statistical Institute of Jamaica Lenin Aguinaga/Ari Silva, REDATAM Development Centre, Latin American and Caribbean Demographic Centre (CELADE), Population Division of ECLAC
10:50 – 11:50	**Discussion**
11:50 – 12:00	**Conclusion** Francis Jones, ECLAC

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