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Integration of administrative and survey data to reduce respondent burden: the Italian experience in the field of agriculture statistics

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Abstract

To increase efficiency of production process Istat has overcome the approach based on a stove-pipe production and, in 2016, has set up a Department for data collection and development of methods and technologies for the production and dissemination of statistical information, where all the cross-cutting technical-scientific support services are grouped (methodology, information technology, data collection and dissemination). Within this Dept. the Data Collection Directorate is in charge of designing, organizing and conducting surveys as well as of getting, storing and managing administrative data provided by institutions and government bodies. The centralization of a such functions within only one Directorate improves opportunities to transfer best experiences into the survey process of different productive sectors.

From perspective of productive sectors, one of the goals - as urged by Istat modernization process- is to reduce response burden and further increase its effectiveness through data reuse, a more systematic use of administrative data as well as new data sources (Big Data) and advanced statistical methodologies for data processing.

One of the ways to reduce survey burden is integrating data from different sources in order to reuse as much as possible existing data. By the way, the main prerequisites are standardization and harmonization of concepts, definitions and classifications as well as availability and punctuality of data, accuracy and reliability, degree of confidentiality and legality constraints in sharing information.

In this presentation we will discuss different scenarios in the use of administrative data integrated with sample surveys. Such scenarios are those experienced in producing agriculture statistics by using data from Ministry of Health and implication in defining prerequisites useful to the goal.

Integration of administrative and survey data to reduce respondent burden: the Italian experience in the field of agriculture production statistics[1]

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Abstract: To increase efficiency of production process, the Italian National Institute of Statistics (Istat) has overcome the approach based on a stove-pipe production and, in 2016, has set up a Department for data collection and development of methods and technologies for the production and dissemination of statistical information, where all the cross-cutting technical-scientific support services are grouped (methodology, information technology, data collection and dissemination). Within this Dept. the Data Collection Directorate is in charge of designing, organizing and conducting surveys as well as of getting, storing and managing administrative data provided by institutions and government bodies. The centralization of such functions within a sole Directorate improves opportunities to transfer best practices into the survey process of different productive sectors.
From the perspective of productive sectors, one of the goals - as urged by Istat modernization process- is to reduce response burden and further increase its effectiveness through data reuse, a more systematic use of administrative data as well as new data sources (Big Data) and advanced statistical methodologies for data processing.
One of the ways to reduce survey burden is integrating data from different sources in order to reuse as much as possible existing data. By the way, the main prerequisites are standardization and harmonization of concepts, definitions and classifications as well as availability and punctuality of data, accuracy and reliability, degree of confidentiality and legal constraints in sharing information.
In this paper we discuss opportunities and difficulties in the use of administrative data for a particular group of agricultural statistics, that is the livestock statistics.

Key words: data integration, administrative data, respondent burden, data quality

1 Introduction

Using data from administrative sources helps to reduce the response burden on data suppliers. This is an important goal, particularly if the respondents are businesses. Business are usually used to supply data for various administrative requirements. When additional information are required, such as in case of statistical surveys, they consider the request as an extra and not necessary administrative fulfillment and tend to avoid any involvement in survey, although they are obliged by law as it is in Italy

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for all the statistical surveys that are included in the Italian National Statistical Programme. As a consequence, response rate decreases as well as the quality of data collected. This trend is growing more and more with the increased awareness from businesses that data can be easily exchanged between data owners by using IT tools.

The reluctance in responding to statistical survey is higher in case of businesses of small and medium size where the owner(s) or the (few) employees do not allow themselves to waste time in activities that are not productive. The risk is higher whether the business is required to participate to short term survey.

This need for burden's reduction is even more necessary in agricultural surveys, given nature and characteristics of respondents (manly farms).

The recent Istat modernization process entails that all activities related to survey's design are centralized within Data collection Directorate. This approach allows to set up a project of overall redesign of agricultural surveys, in order to make them more coherent with Istat modernization guide-lines, in particular about redundancy reduction and data integration.

In this process of redesign of agricultural surveys the use of administrative data is a crucial issue. In fact, if on one side provides great opportunities in terms of data quality and availability, on the other side it poses challenges that have to be faced in order to properly use these data.

In this paper we discuss opportunities and difficulties in the use of administrative data for a particular group of agricultural statistics that is the livestock statistics.

2 Istat modernization process for a better integration of administrative and survey data

The Italian National Institute of Statistics (Istat) has recently launched a project of modernization, whose main objective was to enrich supply and quality of the information produced, while improving effectiveness and efficiency of overall activity.

To increase efficiency of production process, in 2016 Istat has overcame the approach based on a *stove-pipe* organizational structure. This structure was based on production Departments that were almost self-sufficient from the standpoint of resources (so-called "silos"). The self–sufficiency of resources, however, did not seem to be counterbalanced by an efficient governance capable of ensuring uniform actions and transmission of the strategic lines developed by the President and Governance Board. This organizational structure also entailed that each production Department was split into several sub-silos corresponding to the different statistical surveys, which quite

often collected same set of information, processed differently and separated into database that were not interoperable.

This organizational structure entailed considerable risks in terms of consistency, integrity and difficulty of accessing data, with a potential increase of the burden on the respondents, which could be required to provide the same information repeatedly from different applicants.
In order to overcome some inefficiencies a Department for data collection and development of methods and technologies for the production and dissemination of statistical information was set up. Into the Department all the cross-cutting technical-scientific support services are grouped (methodology, information technology, data collection and dissemination). Within the Department, the Data Collection Directorate is a new Directorate in charge of designing, organizing and conducting surveys as well as of getting, storing and managing administrative data provided by institutions and government bodies.

The centralization of all these functions within a single Directorate improves opportunities to transfer best practices into the survey process of different productive sectors. From the perspective of Istat productive sectors one of the goals is to reduce response burden and further increase effectiveness through data reuse, a more systematic use of administrative data as well as new data sources (Big Data) and advanced statistical methodologies for data processing.

In addition, the centralized organization of data collection facilitates collaboration with those institutions that are owners and holders of administrative data because the data exchange from external bodies and Istat takes place through generalized methods and tools. Moreover, the re-use of good practices is encouraged.

In this perspective, the Directorate of Data Collection is required to ensure to:

1) (re)design surveys by making a massive use of administrative data everywhere it is possible;

2) undertake actions oriented to ensure harmonization of metadata in the data collection phase among internal and external databases in order to overcome incomparability of data and facilitate integration of data into registers.

3 Perspectives of optimization of production process of livestock statistics through the use of administrative data

By following recommendation of Istat modernization process, Directorate for environmental and territorial statistics, in charge of livestock statistics, and Directorate of Data collection have recently begun to cooperate with the aim to re-design surveys and making the survey process more efficient and less expensive.

Currently, in order to provide statistics on livestock and meat in accordance to the Regulation EC 1165/2008, Istat carries out a sample survey twice a year about bovines and pigs (referring to the 1st of June and the 1st of December); another sample survey is carried out once a year for providing statistics on sheep and goats (referring to the 1st of December). Sample units are the agricultural holdings with animal farms of one or more animal species. Stratified random samples are designed and selected by the Italian Farm Register. Sample units drawn for the December wave of "t" year (about 9.000 units) are maintained for the following wave carried out in June of "t+1" year (which is a follow-up on the respondents of December, involving about 6.000 units). Both surveys are conducted by Cati technique (Computer assisted telephone interviewing).

In order to reduce burden and modernize production of statistics on livestock, a plan of interventions has been recently defined which consist in three main steps: firstly, reducing surveys sample size preserving the quality of estimations as well; secondly, a progressive change of survey technique from Cati to Cawi. Thirdly, the assessment of quality of administrative data available at Ministry of Health with the aim of (re)using them to produce statistics on livestock.

In Italy, the Ministry of Health Decree of 31/01/02, according to EU Regulation 1760/00, has established the Bovines Register (BR) which is an identification and registration system of bovines. BR was declared operative by the Health Ministry in July 2002. The DG SANCO has controlled its functioning in September 2005 and certified its being fully operative with a Decision on 13/02/06.

The main aim of the BR is to preserve human and animal health by monitoring bovine meat production and marketing conditions. It is a precious information source for consumers and a supporting tool for the assignment of CE's prizes because it allows to trace history of meat products through labelling.

The Decree also called for a National Data Bank (NDB) in which all the relevant information about different "actors" mentioned in the BR need to be recorded (bovines, heard, farmers, etc.). By the way, in the NDB the following information are registered:

- each "individual" animal that is identified by ear tags and followed everywhere (each animal must be provided also with a passport, which follows it everywhere);

- each event concerning the animals, within a given time;

- each firm[2] and herd[3];

- veterinary service competent for each firm and heard.

[2] A firm may comprise several herds.

[3] Several herds may be located in the same place, i.e. belonging to different owners or to different species.

Information flowing in NDB are the declarations provided by the following operators:

1. holders of the animals or their delegates (e.g. the farmers' associations);
2. persons in charge of the slaughterhouses;
3. veterinary services.

Though NDB appears to be a useful database, till now it has been used more to compare and validate data estimations produced by Istat surveys rather than as a real alternative data source.

A better exploitation of NDB could bring important advantages for official statistics in terms of: (i) avoiding the overlap of information between two "official" sources (Istat and Ministry of Health) and making the statistical system more efficient, (ii) reducing costs, (iii) reducing the statistical burden on the respondents and (iv) improving the overall quality of the data.

In this perspective, three different scenarios using administrative data for livestock statistics can be identified:

I. the simplest usage of administrative data could consist in their exploitation in the survey process as regards data editing/imputation, in order to improve the final estimates at least as far bovines are concerned.
II. combining administrative data with sample survey data. A partial substitution of the survey with the administrative source as far as bovines and buffaloes are concerned.
III. produce statistical outputs directly from administrative data (with a breakdown of the time series).

The latter scenario is also legitimated by Article 6 (2,3) of the Regulation EC 1165/2008. According to that, a Member State might derive data from administrative sources other than surveys but it has to inform the Commission in advance and provide details concerning the method to be used and the quality of the administrative source in order to ensure that information obtained from administrative sources is of at least equal quality to information obtained from statistical sources.

The scenarios imply a use of data at different levels but in any case preconditions are timeliness and regularity of the provision of administrative data.

Moreover, the administrative register could be used to derive annually a better sampling frame by integrating it with the Register maintained by Istat (ASIA, Farm Register). The auxiliary information in such improved sampling frame would be very important in the sample design and selection and in the final survey estimation process.

4 Cooperation between Istat and Ministry of Health

Exploring the operational potentialities of the NDB database is necessary in order to understand whether and to what extent data contained in the NDB and collected for non-statistical purposes might substitutes – wholly or partially- data derived from the current CATI surveys carried out by Istat.

Istat and Ministry of Health have begun to cooperate with an ongoing dialogue between experts from the two institutions in order to exploring to evaluate quality of NDB. The main steps of assessment of NDB should be aimed at:

1. analysing metadata in order to understand the relationship between BDN concepts and definitions and those used by Istat (in compliance with Regulation EC 1165/2008);
2. studying the quality of the information supplied by the NDB (data consistency, timeliness, frequency with which the data feed the system, etc);
3. making comparison between NDB data and Istat's survey data;
4. making operational and sustainable proposals addressed to interventions that allow a better exploitation of NDB for statistical purposes.

The work is still in progress. However, a first activity of verifying coherence between NDB's data and Istat survey estimations has taken place and a summary of outcomes can be found in the following paragraph. Next step will be harmonization of classifications by finding a more accurate method of reconciliation of microdata of NDB into the categories required by Regulation EC 1165/2008.

Activities conducted till now, have stressed an important issue. The reuse of data collected for administrative purposes in the perspective of statistical production requires to develop ex ante collaboration among institutions. Ex post interventions can only be "corrective", while during the data collection phase it is possible to ensure that the statistical data fully meet the information requirements.

5 Use of NDB for livestock statistics

The use of NDB is affected by three main issues.

a) Data coming from NDB need to be to pre-treated in order to reconcile the definition of the unit. In fact the agricultural holding, is defined in different ways in case it is in a statistical survey or in NDB.

In the first case, an agricultural holding is defined as "an economic unit of agricultural production under single management comprising all livestock kept and all land used - wholly or partly - for agricultural production purposes, without regard to title, legal

form, or size". The management may be exercised by an individual or an household or a juridical person such as a corporation, cooperative or government agency. "The holding's land may consist of one or more parcels, located in one or more territorial or administrative divisions providing the parcel share the same production means utilized by the holding, such as labour, farm buildings, machinery, etc.. The requirement of sharing the same production means utilized by the holding is necessary if the various parcels are to be considered as components of one economic unit".

In the NDB the "azienda" ("firm") is defined as "each establishment, building and – in the case of open farm – any place where are kept, farmed or managed animals that are the object of Regulation 820/97".

It can be noted that in the BR the firm identifies the place where bovines are kept. A firm may host more than one herd. The latter is indeed defined as "an animal or set of animals kept in a firm intended as epidemiological unit and, in case of more herds in a firm, these must form a distinct unit having the same sanitary qualification".

Therefore the statistical concept of agricultural holding refers to an economic unit which is rather different from the firm as identified in the NDB. In particular, an agricultural holding can have more than one herd in the NDB meaning, also kept in more than one place (i.e. in more than one firm).

Since there is no exact correspondence between the statistical definition of agricultural holding and any concept in the NDB it is necessary to establish a possible way to "reconstruct" the statistical agricultural holding by establishing a connection between concepts, in order to use NDB data for statistical purposes.

As the fiscal code of the owner is present for each herd, it is possible to identify all herds belonging to the same owner but located in different sites (i.e. in different firms according the BR). To the extent that the owner coincides or is in one-to-one relationship with the holder, the animals belonging to this set of herds coincides with the set of animals belonging to an agricultural holding.

In the animal register the "farm" is the place where the animals are bred, consequently:

- in the same farm can be different holders;
- an holder who breeds two different species is counted twice in the animal register.

On the contrary, in the statistical survey the "farm" is the technical-economic unit referred to an holder

b) Data of NDB shows they are not frequently updated; the risk is the over-coverage of units due to farms that ceased their own activity at the specific period of reference but are not suddenly cancelled in the register.

c) The third issue concerns the different classification of the variables of the two sources. The following table shows the classification used in both statistical and administrative sources.

Table 1: Cattle and buffaloes classification in the statistical survey and in administrative NDB

STATISTICAL CLASSIFICATION	ADMINISTRATIVE CLASSIFICATION
<1 year slaughtered like calves	Bovines less than 8 months years old
<1 year breeding males	Bovines males aged from 9 to 12 months
<1 year males for slaughter	Bovines females aged from 9 to 12 months
<1 year breeding females	Bovines males aged from 1 year to less than 2 years
<1 year females for slaughter	Bovines females from 1 year to less than 2 years
1-2 years breeding males	Bovines males aged 2 years and over
1-2 males for slaughter	Heifers (bovines aged 2 years old and over without calves)
1-2 years breeding females	Cows in dairy farms (bovine aged years old with at least one calf)
1-2 years females for slaughter	Cows in other farms (bovine aged 2 years old with at least one calf)
>2 years breeding males	**TOTAL CATTLE**
>2 years males for slaughter	Foreign origin total bovines (not born in Italy)
>2 years breeding heifers	Buffaloes less than 8 months
>2 years heifers for slaughter	Young male buffaloes aged from 9 to 12 months
>2 years dairy cows	Young female buffaloes aged from 9 to 12 months
>2 years other cows	Male buffaloes aged from 1 year to less than 2 years
TOTAL CATTLE	Female buffaloes aged from 1 year to less than 2 years
Of which from foreign origin	Male buffaloes aged 2 years and over
<1 year slaughtered like calves	Heifers (female buffaloes aged 2 years and over without calves)
<1 year breeding males	Breeding female buffaloes (buffaloes aged 2 years and over with at least a calf)
<1 year males for slaughter	Buffaloes in not dairy breeding (buffaloes aged at least 2 years with at least a calf)
<1 year breeding females	**TOTAL BUFFALOES**
<1 year females for slaughter	
1-2 years breeding males	
1-2 males for slaughter	
1-2 years breeding females	
1-2 years females for slaughter	
>2 years breeding males	
>2 years males for slaughter	
>2 years breeding heifers	
>2 years heifers for slaughter	
>2 years dairy cows	
>2 years other cows	
TOTAL BUFFALOES	
Of which from foreign origin	

Moreover, NDB provides further information to the usable to reconcile the classifications, related to the production target of the units (Table 2)

Table 2: Production target of the units in the administrative NDB

PRODUCTION TARGET
Meat herds
Collection center
Genetic center
Genetic center and quarantine
Storage center
Quarantine center
Semen storage center
For rearing
For rearing /slaughtering
For slaughtering
Embryo collection center
Dairy
Mixed herds
Staging point
Animal house

In order to use NDB classification for statistical purposes, a "bridge" table has been built up, combining the available classifications (table 3)

Table 3: Bridge table between the statistical and administrative classification

STATISTICAL CLASSIFICATION	ADMINISTRATIVE CLASSIFICATION	
<1 year slaughtered like calves	Bovines less than 8 months years old+Bovines males aged from 9 to 12 months+Bovines females aged from 9 to 12 months	for slaughter
<1 year breeding males	Bovines less than 8 months years old+Bovines males aged from 9 to 12 months	for breeding + Semen storage center
<1 year males for slaughter	Bovines less than 8 months years old+Bovines males aged from 9 to 12 months	for meat
<1 year breeding females	Bovines less than 8 months years old+Bovines females aged from 9 to 12 months	dairy + breeding
<1 year females for slaughter	Bovines less than 8 months years old+Bovines females aged from 9 to 12 months	for meat
1-2 years breeding males	Bovines males aged from 1 year to less than 2 years	for breeding + Semen storage center
1-2 males for slaughter	Bovines males aged from 1 year to less than 2 years	for meat + for slaughter
1-2 years breeding females	Bovines females from 1 year to less than 2 years	dairy + breeding
1-2 years females for slaughter	Bovines females from 1 year to less than 2 years	for meat + for slaughter
>2 years breeding males	Bovines males aged 2 years and over	for breeding + Semen storage center
>2 years males for slaughter	Bovines males aged 2 years and over	for meat + for slaughter
>2 years breeding heifers	Heifers (bovines aged 2 years old and over without calves)	dairy + breeding
>2 years heifers for slaughter	Heifers (bovines aged 2 years old and over without calves)	for meat + for slaughter
>2 years dairy cows	Cows in dairy farms (bovine aged years old with at least one calf)	dairy + breeding
>2 years other cows	Cows in other farms (bovine aged 2 years old with at least one calf)	for meat + for slaughter
TOTAL CATTLE	**TOTAL CATTLE**	all the items
Of which from foreign origin	Foreign origin total bovines (not born in Italy)	all the items
<1 year slaughtered like calves	Buffaloes less than 8 months years old+Buffaloes males aged from 9 to 12 months+Buffaloes females aged from 9 to 12 months	for slaughter
<1 year breeding males	Buffaloes less than 8 months years old+Buffaloes males aged from 9 to 12 months	for breeding + Semen storage center
<1 year males for slaughter	Buffaloes less than 8 months years old+Buffaloes males aged from 9 to 12 months	for meat
<1 year breeding females	Buffaloes less than 8 months years old+Buffaloes females aged from 9 to 12 months	dairy + breeding
<1 year females for slaughter	Buffaloes less than 8 months years old+Buffaloes females aged from 9 to 12 months	for meat
1-2 years breeding males	Buffaloes males aged from 1 year to less than 2 years	for breeding + Semen storage center
1-2 males for slaughter	Buffaloes males aged from 1 year to less than 2 years	for meat + for slaughter
1-2 years breeding females	Buffaloes females from 1 year to less than 2 years	dairy + breeding
1-2 years females for slaughter	Buffaloes females from 1 year to less than 2 years	for meat + for slaughter
>2 years breeding males	Buffaloes males aged 2 years and over	for breeding + Semen storage center
>2 years males for slaughter	Bovines males aged 2 years and over	for meat + for slaughter
>2 years breeding heifers	Heifers (buffaloes aged 2 years old and over without calves)	dairy + breeding
>2 years heifers for slaughter	Heifers (buffaloes aged 2 years old and over without calves)	for meat + for slaughter
>2 years dairy cows	Buffaloes in dairy farms (bovine aged years old with at least one calf)	dairy + breeding
>2 years other cows	Buffaloes in other farms (bovine aged 2 years old with at least one calf)	for meat + for slaughter
TOTAL BUFFALOES	**TOTAL BUFFALOES**	all the items
Of which from foreign origin	Foreign origin total buffaloes (not born in Italy)	all the items

Notice: Animals less than 8 months have to be weighted by gender.

Moreover, animals belonging to the production target units not considered in the bridge table have to be distributed to all the categories. An ex-post test conducted by using the bridge table has been applied on data referred to June 2016. The results are shown in the following tables.

Table 4: Bovine statistics and administrative data, by categories – June 2016

	ISTAT	NDB
<1 year slaughtered like calves	493.100	639.025
<1 year breeding males	63.873	173.554
<1 year males for slaughter	347.632	216.425
<1 year breeding females	579.672	584.526
<1 year females for slaughter	168.237	143.725
1-2 years breeding males	39.206	31.070
1-2 males for slaughter	490.354	461.639
1-2 years breeding females	686.311	566.345
1-2 years females for slaughter	231.879	317.366
>2 years breeding males	50.109	17.795
>2 years males for slaughter	28.746	49.918
>2 years breeding heifers	543.437	350.888
>2 years heifers for slaughter	74.027	148.196
>2 years dairy cows	1.709.121	1.261.823
>2 years other cows	287.124	818.955
Total Bovine	**5.792.828**	**5.781.250**
from foreign origin	813.265	731.414

Table 5: Bovine statistics and administrative data, by age – June 2016

	ISTAT	NDB	%
total < 1 years	1.652.514	1.757.255	-6,0
males 1-2 years	529.560	492.709	7,5
females 1-2 years	918.190	883.711	3,9
total 1-2 years	1.447.750	1.376.420	5,2
males >2 years	78.855	67.713	16,5
females >2 years	2.613.709	2.579.862	1,3
total >2 years	2.692.564	2.647.575	1,7
Bovine	5.792.828	5.781.250	0,2

Table 6: Buffaloes statistics and administrative data, by categories – June 2016

	ISTAT	NDB
<1 year slaughtered like buffaloes calves	3.619	450
<1 year breeding buffaloes males	5.724	2.677
<1 year buffaloes males for slaughter	3.404	218
<1 year breeding buffaloes females	36.047	51.022
<1 year buffaloes females for slaughter	841	179
1-2 years breeding buffaloes males	5.408	5.507
1-2 buffaloes males for slaughter	1.852	1.588
1-2 years breeding buffaloes females	46.606	39.676
1-2 years buffaloes females for slaughter	488	489
>2 years breeding buffaloes males	6.622	10.255
>2 years buffaloes males for slaughter	1.641	2.253
>2 years females buffaloes	28.769	101.482
>2 years females buffaloes for slaughter	639	1.042
>2 years breeding females buffaloes	238.794	159.240
>2 years females buffaloes in not dairy breeding	9.896	12.810
Total Buffaloes	**390.350**	**388.888**
from foreign origin	845	

Table 7: Buffaloes statistics and administrative data, by age – June 2016

	ISTAT	NDB	%
total < 1 years	49.635	54.546	-9,0
males 1-2 years	7.260	7.095	2,3
females 1-2 years	47.094	40.165	17,3
total 1-2 years	54.354	47.260	15,0
males >2 years	8.263	12.508	-33,9
females >2 years	278.098	274.574	1,3
total >2 years	286.361	287.082	-0,3
Buffaloes	390.350	388.888	0,4

The main results of the ex-post comparison show:

- the total number of bovine and buffaloes livestock have a high degree of comparability. The differences between the two sources are 0,2% for bovine and 0,4% for buffaloes;
- data are less consistent at level of animal age;
- important differences exist for some categories.

The last point suggests to deepen more the activity in building up the bridge table, using further information available in the NDB, as the race or the precise age of the animal.

6 Conclusions

The use of NDB in place of statistical surveys on livestock is a possible way of containing the statistical burden on farmers. A condition for adopting this source of information for statistical purposes is that the quality of the statistics obtained should not be lower than that obtained by survey. Different possible uses of administrative data could be done, i.e. as complementary source of data or in substitution of the sample survey.

The analyses summarized in this paper shows that there is a good correspondence for the total number of bovines and buffaloes between data in the NDB and data of survey, but data are less consistent when compared by categories. Moreover the transition from the survey to the administrative-based statistics requires an increase of the coverage issues and in general a stronger cooperation between Istat and Ministry of Health.

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