

Methodological notes

Since 1997 Istat has conducted a quarterly “Trips and holidays” survey on tourism demand which is part of the resident household Multi-Purpose Survey System.

The survey is of the sample type (see Sampling strategy and evaluation of sampling errors). The survey reference population, i.e. the set of investigated statistical units, is composed of households resident in Italy and their individual members (Italian and foreign residents of all ages). The data are collected via computer assisted telephone interviewing (CATI).

The survey provides a suitable tool for the analysis of the differing types of tourism demand, tourism patterns and travel methods (with overnight stays) through the collection of information on destinations, form of chosen organisation, type of accommodation used, means of transport, duration of stay, period of the year in which trips are taken etc. It is also the primary source of information on 'hidden' tourism demand, namely paid holidays in private homes, vacations by owners at second holiday homes and stays at the homes of friends or relations.

Tourism flows are classified according to international standards which distinguish between trips for work purposes and holidays as well as between short and long holidays. Holidays include trips for the purpose of leisure, pleasure, relaxation, visiting friends or relatives, health treatment and religious reasons.

In addition to trips, an analysis is also made of travellers and overnight stays during the holiday.

Guidelines

To enable correct interpretation of the data contained in the tables you are advised to read the section on “Definitions and classifications”, particularly as regards the definition of trip which refers to tourist trips with at least one overnight stay outside the “usual environment”, namely outside the person's place of residence and places travelled to on a weekly basis. Further, since the seasonal nature of tourism and the characteristics of the various types of trips have the effect that certain aspects of travel are, in quantitative terms, quite rare in given periods of the year, particular care and attention should be adopted in analysing and evaluating estimates. In this connection, you are advised to take sampling errors into account (see “Sampling strategy and evaluation of sampling errors”).

Bear in mind that the survey records tourist flows concluded within each quarter including those that began prior to the start of the quarter. As regards the charts and tables, note therefore that the quarterly data refer to trips concluded within each quarter irrespective of the start date.

The data on trips and overnight stays refer to quarterly estimates and annual estimates; the latter are obtained by summing the quarterly values.

Data on travellers, unlike data on trips and overnight stays, refer to quarterly estimates alone, or in some cases, to average quarterly values derived from estimates for all four quarters.

Consider also that quarterly data on the number of travellers are not accumulable in that the same person may make trips in different quarters, hence the sum would lead to an overestimate of the number of people who made trips during the year. Similarly, the totals for travellers broken down by type of trip or destination do not correspond to the sum of the partial figures due to the incidence of people who made different types of trips or travelled to different destinations. For example, a person who in the quarter July-September took both short and long holidays is included both among the short- and long-holiday tourist groups but only once among the overall tourist group. Similarly, a person who took both short holidays in Italy and short holidays abroad is included among short-holiday tourists in Italy and short-holiday tourists abroad, but only once in the overall figure of short-holiday tourists.

Note that the charts include both time-based comparisons and data related to the survey reference year, whereas the detail tables comprise data for the reference year alone.

Bear in mind that absolute data are expressed in thousands; furthermore, the totals may not match due to rounding. Also, as percentages and quotients are calculated from absolute data before rounding, these may not coincide with the results obtained through processing the data expressed in thousands.

Note that a minus sign (-) indicates the existence of a known phenomenon but that no cases occurred in the sample; (..) indicates that numerosity does not reach half the considered minimum order figure or that the low incidence of the phenomenon renders the calculated values non-significant.

Bear in mind that the sample survey is conducted on households (the survey units) hence results refer to the resident population less permanent members of collective facilities (hospitals, prisons, religious communities etc.).

For comparisons with data from previous “Trips and holidays” surveys, certain changes introduced during the initial years of the survey to improve the accuracy of the estimates should be taken into account. This applies in particular to the modifications made to the summary form on trips contained in the 1998 questionnaire that contributed substantially towards the improvement of tourism flows estimates, especially with regard to short holidays and trips for work purposes.¹

For historical comparisons with data prior to 1997 obtained from previous Istat surveys on holidays taken by residents in Italy and through the “Aspects of daily life” surveys, it is important to take into account not only routine procedures when comparing different sources but also the problems that arise when comparing survey data with different reference periods, given that in the past the reference period was the calendar year. It may be conjectured that interviewees have greater difficulty in remembering events in relation to the length of the reference period. Differences can in fact be observed between quarterly survey data and those from previous year-based holiday surveys. From an analysis of monthly trip distribution, it emerges that estimates based on annual reference periods indicate a higher concentration of holidays in the traditional months of July and August compared to information collected quarterly. When the survey reference period is annual, interviewees may mainly remember trips made during their habitual holiday period and more frequently forget trips made at other times, particularly those furthest from when the survey is conducted.

Main definitions and classifications

The ‘Trips and holidays’ survey uses the standard definitions set out in the methodology adopted for the implementation of Directive 95/57/EC on Tourism Statistics.²

Tourist flows are defined as trips with at least one overnight stay outside the “usual environment”, namely outside the person's place of residence and places travelled to on a weekly basis.

To enable correct interpretation of the results it is important to clarify the meaning of the adopted definitions:

- ***trip***
displacement either for tourism or work outside a person's place of residence involving at least one overnight stay at the destination; trips do not include displacements to locations travelled to on a weekly basis with one or more overnight stays nor stays longer than one year; in the latter case the trip is not classed as a tourist flow as the location visited is considered as the place of residence;
- ***tourist***
person who has made one or more trips in the survey reference quarter.

Trips are also divided into the following types:

- ***trips for work and professional reasons***

¹ For in-depth details refer to Appendix B of the volume: ISTAT. *Trips in Italy and abroad in 1998* Rome: ISTAT, 1999. (Information section n. 25), or the volume: ISTAT. *Methodology and organisation of the multi-purpose survey on tourism demand 'Holidays and Trips'*. Rome: ISTAT, 2003. (Methods and Norms n. 17).

² Eurostat. Community methodology on Tourism Statistics. Brussels: Eurostat, 1998.

trip made prevalently for the purpose of temporary work outside the place of employment or for general professional reasons (missions, attending congresses, conventions etc.): these trips also include those made for professional training and updates or to take part in competitions for job vacancies;

- **holiday trips**

trips made prevalently for the purpose of relaxation, pleasure, leisure, rest, visiting friends or relations, as well as for religious reasons/pilgrimages, spa and other health treatments;

results for holidays are presented in relation to the duration of stay as either:

- *short holiday* : corresponding to holidays with less than 4 overnight stays;

- *long holiday* : corresponding to holidays with 4 or more overnight stays.

The following definitions have been adopted:

- **destination, means of transport, type of accommodation, purpose of holiday, type of pleasure/leisure holiday, purpose of work trip**

this information is collected according to the principle of “prevalence”: in particular, the destination of the trip and the type of accommodation are associated respectively with the location and the type of accommodation in which most of the overnight stays were spent, while the means of transport is that used to cover the greater part of the trip;

- **organisation**

- *direct booking* refers to the booking of accommodation and/or transport directly with the accommodation establishment or travel company;

- *indirect booking* refers to the booking of accommodation and/or transport through a travel agency or tour operator;

- *online booking* refers to the use of the Internet to book accommodation and/or transport either directly or through a travel agency;

- **abroad**

- *Europe*: the EU countries and other European countries;

- *European Union*: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal, United Kingdom, Spain, Sweden, Cyprus, Estonia, Latvia, Lithuania, Malta, Poland, Czech Republic , Slovenia, Slovakia, Hungary, Bulgaria, Romania;

- *other European countries*: Norway, Russia, Switzerland, Liechtenstein, Turkey and other European countries not elsewhere classified;

- *extra-European countries*: all countries not included in the above-mentioned European countries.

- **geographical area**

the geographical areas are territorial subdivisions of Italy formed by administrative regions and defined as follows:

- *North*: Piedmont, Aosta Valley/Vallée d’Aoste, Lombardy, Liguria, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Emilia-Romagna

- *Centre*: Tuscany, Umbria, Marche, Lazio

- *South and the Islands*: Abruzzo, Molise, Campania, Apulia, Basilicata, Calabria, Sicily, Sardinia;

- **type of municipality**

Italian municipalities are divided into the following types:

- *central municipalities of metropolitan areas*: Turin, Milan, Venice, Genoa, Bologna, Florence, Rome, Naples, Bari, Palermo, Catania, Cagliari;

- *peripheral municipalities of metropolitan areas*: satellite municipalities around the centre of a metropolitan area, as defined according to the results of the Population Census;

- *other municipalities* classed according to population size (over 50,000 inhabitants, from 10,001 to 50,000 inhabitants, from 2,001 to 10,000 inhabitants, up to 2,000 inhabitants).

Data on the characteristics of individuals are those recorded at the time of interview. In particular:

- **age** refers to age in years;
- **condition**: the condition declared as sole or prevalent by people aged 15 and over:
 - *employed*: those in self-employment or employed work from which they derive income or payment (earnings, fee, wage, salary) or who collaborate with a self-employed family member without having a standard employment contract (assistant);
 - *first-time job-seeker*: those who have never performed any working activity and are seeking a suitable job that they are willing to accept if offered;
 - *new-job-seekers*: those who have lost their previous wage or salary job and are actively seeking a suitable job that they are willing to accept if offered;
 - *housewife*: those prevalently engaged in housekeeping activities;
 - *student*: those prevalently engaged in educational studies;
 - *retired*: those who have ceased work for reasons of age limits, disability or other cause; a distinction must be made between retired people and pensioners in that retired people do not necessarily receive a pension and pensioners do not necessarily receive a pension from previous employment;
 - *other condition*: those whose condition differs to those mentioned above (military draftee, unfit for work, wealthy self-sufficient, prison detainee etc.).

Sampling strategy and evaluation of sampling errors

1. Introduction

The survey reference population, i.e. the entire set of statistical units under investigation, is composed of resident households in Italy and their individual members, less the permanent members of collective facilities. A household refers to a *de facto* family, namely a group of cohabiting people linked by bonds of marriage, kinship, affinity, adoption, guardianship or affection.

The survey is conducted by telephone interview and the sample selection list is derived from the official national archive of private fixed telephone line subscribers; the sampling units are, therefore, the telephone numbers contained in the above-mentioned archive.

Four surveys are conducted in any one year in the months of April, July, October and January. The reference period for each survey is the immediate preceding quarter. For example, the survey conducted in April refers to the first quarter of the year.

Each quarterly survey is based on a sample of about 3,500 households and varies from the samples used in the other three surveys.

The aim of the survey is to provide estimates of parameters of various types (totals, averages, ratios, absolute and relative frequencies) with different temporal and spatial references. Estimates for each quarter refer to the entire national territory, while the territorial domains of reference for estimates for the entire year are:

- the entire national territory;
- the three main geographical areas, (North, Centre, South and the Islands);
- the geographical regions (only as regards certain more important estimates);
- the type of municipality obtained by breaking down Italian municipalities according to their socio-economic and demographic characteristics (based on the resident population for the year of reference):

A, *metropolitan areas* divided into :

- A1, central municipalities of metropolitan areas: Turin, Milan, Venice, Genoa, Bologna, Florence, Rome, Naples, Bari, Palermo, Catania and Cagliari;
- A2, peripheral municipalities of metropolitan areas;

B, *non-metropolitan areas* divided into:

- B1, municipalities with up to 2,000 inhabitants;
- B2, municipalities with 2,001 to 10,000 inhabitants;

B3, municipalities with 10,001 to 50,000 inhabitants;
B4, municipalities with over 50,000 inhabitants.

2. Characteristics of the selection list

The adopted sample base, i.e. the list of selected sampling units, is the official computerized archive of private fixed telephone line subscribers. This choice is motivated by the fact that the information contained in the archive is continuously updated with regard to variations in subscriber telephone numbers and addresses; it also facilitates selection of the sampling units since it makes it possible to adopt different sort criteria.

The information for each address, which can be used to stratify the reference population units, is essentially area-related: province, municipality, census section, street name, house number and, lastly, the size of each municipality both in terms of population figures and the number of addresses.

The main problems that arise from use of the telephone directory as a sampling basis for surveying households are that the population under investigation and the total set of units contained in the list do not perfectly coincide: if L and U are used to represent respectively the directory and reference population, the possible situations in which the sets L and U differ are generally as follows:

- I. over-coverage when certain elements in the set L do not belong to the set U;
- II. under-coverage when certain elements in U are not contained in L;
- III. duplication of certain units when multiple instances of certain elements of U are contained in L;
- IV. clusters of units when certain elements in the set L contain clusters of elements in the set U.

To varying degrees the telephone list used in the survey presents all the above-listed situations, however the most significant phenomena appear to be over- and under-coverage. Cases of over-coverage include all telephone numbers of second homes, business enterprises and public establishments etc. Conversely, cases of under-coverage include households without a telephone line subscription and ex-directory subscribers. Case III comprises households with more than one main residence telephone number and Case IV phone numbers that correspond to more than one household.

Each of these situations causes a non-controlled variation of the probability of inclusion of population units compared to the theoretical probability of inclusion assigned to such units by the adopted sample design. This may lead to distortions in the estimates produced by the survey.

In particular, as regards the variables studied in the survey, under-coverage leads to a distortion of the produced estimates that increases in relation to the degree by which U units belonging to L differ from U units not contained in L. This distortion effect can be partially attenuated using appropriate estimation procedures known in the literature as calibration estimators³, which take into account known totals (derived from sources outside the survey) of the population with regard to auxiliary variables correlated with those under investigation.

One effect of over-coverage is that the sample number is lower than that defined in the survey design stage, thus leading to increased variability of the estimates. A decision therefore needs to be taken as to whether to accept a lower sampling scale than originally planned, or, alternatively, to adopt an over-sized sample or a list of substitute units. In telephone surveys outsourced to external companies, substitution is generally adopted in that it is necessary to ensure that the company conducts a pre-set number of useful interviews. Recourse to substitution is highlighted in charts 1 and 2 which indicate the substitution rate respectively by region and type of municipality as observed in the October-November survey quarter.

3. Sample design

3.1 General description

The sample design is a stratified cluster design in which each cluster is a telephone address contained in the selection archive. All individuals belonging to the sample clusters, i.e. belonging to the households to which the selected numbers correspond, are included in the sample.

³ See English language literature on the subject such as Deville J.C. and Särndal C.E. "Calibration Estimators in Survey Sampling", *Journal of the American Statistical Association*, 87 (1992): 1013-1020.

The telephone addresses were stratified within each geographic region according to the socio-demographic type of the municipality (described in paragraph 1). Since this information is not contained in the selection archive, it was necessary to supplement the archive by attributing to each record a relevant type code.

In multi-objective surveys such as the one in question, the determination of the total number of sample units and its allocation among the strata is generally a complex operation. Indeed, it is unrealistic to assume that a sample can be defined that ensures pre-set levels of accuracy for all estimates under study also in consideration of the fact that the produced estimates are derived from different temporal and territorial frames of reference. The optimal allocation of sample units referred to a given domain type may be inconsistent with the optimal allocation referred to another type of territorial domain. In fact, with regard to estimates related to the entire national territory, the optimal allocation is proximal to the proportional allocation among the various regions; conversely, with regard to regional estimates, the optimal allocation is proximal to an allocation that assigns a sample of the same numeric consistency to all regions. It is therefore necessary to adopt a complex procedure split into several stages.

Firstly, after mediating between operational needs, related costs and the reliability requirements of the main estimates of interest, a total number of sample addresses n was defined equivalent to approximately 3,500. Subsequently, based on evaluations of the expected sampling error in the main estimates at regional and national level, the allocation of the sample among the regions was determined; a compromise was thus obtained between a uniform allocation and an allocation proportional to the demographic weight of each region. Lastly, the regional sample sizes were distributed over the different types of municipality in proportion to the resident population.

Chart 1 - Regional distribution of the sample and substitution rates – Fourth quarter 2008

REGION	Sample addresses	Total substitution rate (a)	Total substitution rate net of failed contacts (b)
Piedmont	266	22.2	13.9
Aosta Valley	93	37.6	21.5
Lombardy	329	18.5	12.8
Trentino-Alto Adige	206	28.2	15.0
<i>Bolzano-Bozen</i>	99	29.3	18.2
<i>Trento</i>	107	27.1	12.1
Veneto	201	19.9	16.4
Friuli-Venezia Giulia	139	27.3	20.1
Liguria	152	27.0	11.8
Emilia-Romagna	197	21.3	14.2
Tuscany	213	23.0	15.0
Umbria	103	29.1	19.4
Marche	141	19.1	11.3
Lazio	220	29.5	18.6
Abruzzo	144	20.8	13.9
Molise	95	22.1	16.8
Campania	196	32.7	25.5
Apulia	187	24.6	19.8
Basilicata	99	25.3	19.2
Calabria	158	29.1	23.4
Sicily	213	33.8	28.6
Sardinia	150	31.3	17.3
Italy	3,502	25.6	17.5

- (a) The total substitution rate is calculated as the percentage ratio between the number of substituted households and the theoretical number of sample households. It excludes substitutions required due to list 'errors', which are particularly numerous in certain zones mainly because of the presence of telephone numbers that do not refer to principal dwellings (second homes).
- (b) The substitution rate net of failed contacts is calculated as the percentage ratio between the number of substituted household, filtered from substitutions due to failed contacts, and the theoretical number of sample households. A failed contact refers to 7 unanswered telephone calls to a household made on different days and at different times.

Charts 1 and 2 show the theoretical sample size and substitution rates referred to the fourth quarter of the survey, respectively by region and by type of municipality; for each region the substitution rate is calculated as the ratio between the number of substituted addresses and the theoretical number of sample addresses.

Chart 2 – Distribution of the sample by type of municipality and substitution rates – Fourth quarter 2008

TYPE OF MUNICIPALITY	Sample addresses	Total substitution rate	Total substitution rate net of failed contacts
Central municipalities of metropolitan areas	420	26.7	17.9
Peripheral municipalities of metropolitan areas	320	24.4	18.8
Municipalities up to 2,000 inhabitants	296	30.1	18.9
Municipalities with 2,001-10,000 inhabitants	922	25.3	16.3
Municipalities with 10,001-50.000 inhabitants	911	25.4	17.8
Municipalities with over 50,000 inhabitants	633	24.2	17.2
Italy	3,502	25.6	17.5

3.2. Selection of the sample

The extraction of the sample addresses from each stratum, obtained by cross-relating region and type of municipality, was performed with equal probabilities and without re-immission via systematic selection technique. Selection of the address sample is carried out as follows:

- for each stratum, the addresses from the Household Telephone Archive are sorted according to population size of the municipality, street name, house number and floor;
- extraction interval p is defined as the ratio between the number of addresses contained in the archive and the number of addresses to be extracted; a random number is selected between 1 and p then the sample addresses are selected according to the extraction interval and from the random starting point;
- each address selected from the Archive is entered into the *base list* and for each address the three subsequent addresses are selected which are entered into the *substitution list*; in this way the substitutive units are territorially as *near* as possible to the respective base sample units thus, presumably also *similar* in terms of socio-economic characteristics.

4. Estimate calculation procedure

The survey produces estimates of the number of trips and the number of overnight stays away from home by type of trip as well as the number and characteristics of the individuals who make such trips.

These estimates are obtained using a calibration estimator (see paragraph 2), which is the standard method of estimation for most ISTAT surveys on business enterprises and households.

The principle on which all sample estimates are based is that the units belonging to the sample should also represent the units of the population that are not included in the sample.

This is achieved by attributing a weight to each sample unit that indicates the number of units of the population represented by the unit itself. If, for example, a sample unit is attributed a weight of 100, this means that the unit represents itself and 99 other units of the population not included in the sample.

In order to clarify the illustration given further below, the meanings of the terms used are as follows: d , reference territory spacial extent index; t , quarter index ($t = 1, \dots, 4$); j , household index; p , household constituent index; h , stratum index; y , generic survey variable; Y_{thjp} value of y observed for constituent p of household j in stratum h surveyed in quarter t ; P_{hj} , number of constituents of household j in stratum h ; M_h , number of resident households in stratum h ; m_h , sample of households in stratum h ; H_d , number of strata in domain d .

Let us assume the requirement to estimate, with regard to a generic domain d (for example, a geographic region) and in relation to a generic quarter t , the total of the variable y , expressed by the following relation:

$${}_d Y_t = \sum_{h=1}^{H_d} \sum_{j=1}^{M_h} \sum_{p=1}^{P_{hj}} Y_{thjp} \quad (1)$$

An estimate of the total (1) is given by the following expression:

$${}_d\hat{Y}_t = \sum_{h=1}^{H_d} \hat{Y}_h = \sum_{h=1}^{H_d} \sum_{j=1}^{m_h} \sum_{p=1}^{P_{hj}} Y_{thjp} W_{thj}, \quad (2)$$

in which W_{thj} is the final weight to be attributed to household j in stratum h and to all its constituents.

From the above relation, it can be deduced that in order to obtain the estimate of the total (1) it is necessary to multiply the final weight associated to each sample unit by the value of y assumed by each unit and sum the products thus obtained for the domain in question.

The weight to be attributed to the sample units is obtained by means of a complex procedure aimed at:

- correcting distortion caused by list errors and the phenomenon of the total failed response;
- taking into consideration certain known totals regarding the reference population and the requirement that the sample estimates of such totals must correspond to the respective known values. For the survey in question the known totals⁴ are:
 - the resident population for the 6 types of municipalities;
 - the resident population by sex in the 20 Italian regions;
 - the resident population divided into 8 age groups⁵;
 - single-member households aged less than 65, by sex;
 - single-member households aged 65 and over, by sex;
 - households with more than one member by size class⁶

Adopting, therefore ${}_kX$ to indicate the known total of the auxiliary k -ma variable ($k=1 \dots K$) and ${}_kX_{thjp}$ to indicate the value assumed by the auxiliary k -ma variable related to the respondent individual $thjp$, the above-described condition is expressed by the following equation:

$${}_kX_t = \sum_{h=1}^H \sum_{j=1}^{m_h} \sum_{p=1}^{P_{hj}} {}_kX_{thjp} W_{thj} \quad k=1 \dots K.$$

The procedure for the construction of the final weights to be attributed to the sample units is split into the following stages:

- 1) the base weight (or direct weight), obtained as the reciprocal of the probability of inclusion of each sample unit;
- 2) the correction factor is then calculated that makes it possible to satisfy the condition of equality between the known population totals and the corresponding sample estimates;
- 3) the final weight is given by the product of the base weight for the above-indicated correction factors.

The correction factor referred to in point 2) is obtained by resolving a constrained minimum problem in which the function to be minimised is the distance between the base weights and the final weights and the constraints are defined by the condition that the sample estimates of the above-defined population totals coincide with their known values.

With regard to the entire year, the parameters of interest may be either the annual totals, ${}_dY$, or the annual averages of quarterly data ${}_d\bar{Y}$. The annual totals – obtained as the sum of the totals (1), regarding the four quarters – refer to the annual total of trips and the annual total of overnight stays away from home during trips. The annual averages of quarterly data – obtained as the arithmetic average of the totals (1) – instead refer to the average number of people who have travelled during the quarter. With regard to the generic domain d , the estimates of the above-mentioned parameters ${}_dY$ and ${}_d\bar{Y}$ are obtained respectively through the following expressions:

$${}_d\hat{Y} = \sum_{t=1}^4 {}_d\hat{Y}_t, \quad (3)$$

4 The first three totals are desumed from demographic data sources (registry office records), whereas the totals for households are derived from the estimates obtained through the annual multi-purpose survey "Aspects of daily life".

5 The age groups considered are: 0-5 years, 6-14 years, 15-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65 years and above.

6 The size classes considered are: 2 members and 3 or more members.

$${}_d\hat{Y} = \frac{1}{4} \sum_{t=1}^4 {}_d\hat{Y}_t \quad (4)$$

Lastly, certain parameters of interest are given by the ratio between totals; in this case, the estimate can be obtained as the ratio between the estimated totals:

$${}_d\hat{R} = \frac{{}_d\hat{Y}_1}{{}_d\hat{Y}_2}.$$

5. Evaluation of estimate accuracy levels

The main statistics of interest to evaluate the sample variability of the estimates produced by the survey are the absolute sampling error and the relative sampling error.

Using $\hat{\text{Var}}({}_d\hat{Y}_t)$ to indicate the estimate of the variance of the estimate ${}_d\hat{Y}_t$, referred to domain d and to survey quarter t , the estimate of the absolute sampling error of ${}_d\hat{Y}_t$ can be obtained through the following expression:

$$\hat{\sigma}({}_d\hat{Y}_t) = \sqrt{\hat{\text{Var}}({}_d\hat{Y}_t)}. \quad (5)$$

The estimate of the relative sampling error of ${}_d\hat{Y}_t$, is instead defined by the expression:

$$\hat{\varepsilon}({}_d\hat{Y}_t) = \frac{\sqrt{\hat{\text{Var}}({}_d\hat{Y}_t)}}{{}_d\hat{Y}_t}. \quad (6)$$

The estimate of variance, $\hat{\text{Var}}({}_d\hat{Y}_t)$, is obtained as the sum of the estimate of the variance of the individual strata belonging to domain d ; in symbols:

$$\hat{\text{Var}}({}_d\hat{Y}_t) = \sum_{h=1}^{H_d} \hat{\text{Var}}(\hat{Y}_{th}) = \sum_{h=1}^{H_d} M_h^2 \frac{M_h - m_h}{m_h M_h} \sum_{j=1}^{m_h} \frac{(e_{thj} - \bar{e}_{th})^2}{m_h - 1} \quad (7)$$

where

$$e_{thj} = \sum_{p=1}^{P_{hj}} Y_{thjp} - \hat{\beta} \sum_{p=1}^{P_{hj}} X_{thjp} \quad \text{and} \quad \bar{e}_{th} = \frac{1}{m_h} \sum_{j=1}^{m_h} e_{thj};$$

in which X_{thjp} is the vector of the auxiliary K variables used to construct the calibration estimator and $\hat{\beta}$ is the vector of the estimated regression coefficients of the linear model that links the variable Y to the auxiliary variables X .

A description is now given of the methodology used to calculate the sampling errors of the estimates of the parameters referred to the entire year. With regard to the estimate of an annual total (3), the absolute and relative sampling errors, considering the independence of the four quarters, are expressed respectively by the following formulas:

$$\hat{\sigma}({}_d\hat{Y}) = \sqrt{\sum_{t=1}^4 \hat{\text{Var}}({}_d\hat{Y}_t)}, \quad \hat{\varepsilon}({}_d\hat{Y}) = \frac{\hat{\sigma}({}_d\hat{Y})}{{}_d\hat{Y}} \quad (8)$$

With regard instead to the estimate of an annual average (4), the absolute and relative sampling errors are given respectively by the following expressions:

$$\hat{\sigma}({}_d\hat{Y}) = \frac{1}{4} \sqrt{\sum_{t=1}^4 \hat{\text{Var}}({}_d\hat{Y}_t)}, \quad \hat{\varepsilon}({}_d\hat{Y}) = \frac{\hat{\sigma}({}_d\hat{Y})}{{}_d\hat{Y}}. \quad (9)$$

Lastly, the estimate of the relative errors of ratio estimates between totals, in the simplified hypothesis that the ratio is independent from the value of the denominator, can be obtained as:

$$\hat{\varepsilon}(\hat{d}\hat{R}) = \sqrt{\hat{\varepsilon}^2(\hat{d}\hat{Y}_1) - \hat{\varepsilon}^2(\hat{d}\hat{Y}_2)}. \quad (10)$$

The sample errors enable an evaluation to be made of the degree of accuracy of the estimates; furthermore, the absolute error makes it possible to construct the confidence interval in which P is likely to contain the parameter of interest. With regard to a generic estimate \hat{Y} this interval assumes the following form:

$$\{\hat{Y} - k\hat{\sigma}(\hat{Y}), \hat{Y} + k\hat{\sigma}(\hat{Y})\} \quad (11)$$

In (11) the value of k depends on the value set for P; for example, if P=0.95 then k=2.

6. Summary presentation of sampling errors

Since each estimate $\hat{d}\hat{Y}_t$ has a related sampling error $\hat{\varepsilon}(\hat{d}\hat{Y}_t)$, in order to allow correct use of the information produced by the survey it would be necessary to also publish the related sampling error for each estimate. Due, however, to time limits and processing costs, and to the fact that the published charts would be cluttered and over-complex for the end-user to consult, it is not possible to publish all sampling errors for the estimates provided. In addition, errors related to unpublished estimates would obviously not be available, although users can determine these on their own.

Nevertheless, in order to enable an evaluation to be made of the sampling variability of all estimates of interest recourse is taken to a summary presentation of the related errors using regressive models based on the determination of a mathematical function that correlates each estimate with its specific sampling error. The approach adopted for the construction of the models differs according to whether the variable being estimated is qualitative or quantitative. In fact, whereas for estimates of absolute (or relative) frequencies related to qualitative variable modes it is possible to use theoretic-based models (according to which the relative errors of the estimates of absolute frequencies are a decreasing function of the values of the estimates themselves), estimates of totals of quantitative variables are rather more complex in that an adequate theoretic basis has not yet been developed for the interpolation of the sampling errors in the estimates in question. An empirical approach is therefore adopted in dealing with quantitative variables based on experimental evidence that the absolute error of a total is an increasing function of the total itself.

The models adopted for the two types of variables are described below.

6.1. Summary presentation of sampling errors for estimates of frequencies referred to individuals

The model used for estimates of absolute frequencies, in relation to the generic domain d and in the quarter t, is of the following type:

$$\log \hat{\varepsilon}^2(\hat{d}\hat{Y}_t) = a + b \log(\hat{d}\hat{Y}_t) \quad (12)$$

in which the parameters a and b are estimated using the ordinary least squares method. Analysis of the obtained regression coefficients shows that the coefficients for the first, second and fourth quarters are basically similar, while different results emerge for the third quarter; therefore, for simplicity, only the results for the first and third quarter are presented. Further, an analogous model to (12) was estimated in relation to the average of the 4 quarters.

Charts 3 (quarters) and 4 (average of the 4 quarters) indicate the values of the coefficients a and b, and of the determination index R^2 of the functions used for the interpolation of the sampling errors in the frequency estimates referred to individuals by territorial area.

Moreover, in order to facilitate calculation of the sampling errors, charts 5 (quarters) and 6 (average of the 4 quarters) indicate, by territorial area, the interpolated values of the relative percentage sampling errors for certain typical values deduced from the estimates of absolute frequencies.

The first column of the charts shows increasing K values of estimates $\hat{d}\hat{Y}_t^k$ ($k=1, \dots, K$), and the second indicates the respective relative interpolated errors $\hat{\varepsilon}(\hat{d}\hat{Y}_t^k)$. The information contained in the chart makes it possible to calculate the relative error of a generic absolute frequency estimate using two easily applicable procedures which, however, lead to less precise results than when expression (12) is directly applied.

The method involves approximating the relative error $\hat{\varepsilon}(\hat{Y}_t)$ of the estimate of interest \hat{Y}_t with the relative error corresponding to the estimate level indicated in the charts (5 or 6) closest to the estimate level \hat{Y}_t .

In the second method, the estimate sampling error \hat{Y}_t can be calculated using the following expression:

$$\hat{\varepsilon}(\hat{Y}_t) = \hat{\varepsilon}(\hat{Y}_t^{k-1}) + \frac{\hat{\varepsilon}(\hat{Y}_t^k) - \hat{\varepsilon}(\hat{Y}_t^{k-1})}{\hat{Y}_t^k - \hat{Y}_t^{k-1}} (\hat{Y}_t - \hat{Y}_t^{k-1}) \quad (13)$$

where: \hat{Y}_t^{k-1} e \hat{Y}_t^k are the estimate values within which the estimate of interest \hat{Y}_t and $\hat{\varepsilon}(\hat{Y}_t^{k-1})$ is included, and $\hat{\varepsilon}(\hat{Y}_t^k)$ are the corresponding relative errors indicated in the chart.

6.2. Summary presentation of sampling errors for estimates of totals referred to trips and overnight stays

The model used for estimates of the total number of trips and overnight stays, in relation to the generic domain d and in the quarter t , is of the following type:

$$\hat{\sigma}(\hat{Y}_t) = a + b \hat{Y}_t + c \hat{Y}_t^2 \quad (14)$$

in which the parameters a , b and c are estimated using the ordinary least squares method and adapting model (14) to a point cloud composed of a large number of couples $(\hat{\sigma}(\hat{Y}_t), \hat{Y}_t)$. Since model (14) is of an empirical type, the set of the estimates \hat{Y}_t used to interpolate the model was determined so as to include the majority of published estimates. In order to obtain better adaptation to the point cloud, a model was interpolated – in relation to each quarter and in relation to the entire year – for each of the following estimate subgroups:

- number of overnight stays for work trips;
- number of overnight stays for holiday trips;
- total number of overnight stays during trips;
- number of work trips;
- number of holiday trips;
- total number of trips.

As in the previous case, analysis of the obtained regression coefficients shows that the coefficients for the first, second and fourth quarters are basically similar whereas they differ considerably to those for the fourth quarter; this can be explained by the fact that the trends of the surveyed phenomena in the third quarter are dissimilar to those in the other three.

To avoid over-complicating the exposition, results are therefore presented here for the first quarter, third quarter and for the entire year.

Charts 7, 9 and 11 (relating to overnight stays and trips) show the values of the coefficients a , b , c and of the determination index R^2 of the models used for the interpolation of the sampling errors in the estimates of totals by territorial area and by each of the six types of estimates listed above in relation to the first quarter, third quarter and the entire year.

The subsequent paragraph illustrates the method used to calculate the absolute and relative sampling error in an estimate using the information contained in the charts.

Using the estimated values of the parameters in model (14) and dividing both members of the model by the estimate value \hat{Y}_t , the following second degree equation is arrived at:

$$a + [b - \varepsilon(\hat{Y}_t)] \hat{Y}_t + c(\hat{Y}_t)^2 = 0$$

whose positive root is expressed by the following formula:

$$\hat{dY}_t = \frac{-[b - \varepsilon(\hat{dY}_t)] - \sqrt{[b - \varepsilon(\hat{dY}_t)]^2 - 4ac}}{2c} \quad (15)$$

Charts 8, 10 and 12 (relating to overnight stays and trips) show the values of the estimates \hat{dY}_t^* obtained through the relation (15) for certain typical pre-set values of the relative percentage error which are indicated as $\varepsilon^* = \varepsilon(\hat{dY}_t^*)$; estimates with values greater than \hat{dY}_t^* present values of the relative error lower than ε^* , while estimates that assume values lower than \hat{dY}_t^* present values of the relative error greater than ε^* . In these charts, which are divided according to group of estimates, quarters and territorial area, the pre-set values of ε^* are: 1, 5, 10, 15, 20, 25 and 30%. Use of the charts will be better clarified in the following paragraph by means of a numeric example.

Chart 3 - Values of the coefficients a, b and of R² of the functions used for interpolation of the sampling errors of the estimates of absolute frequencies referred to individuals by territorial area - Quarters – Year 2008

TERRITORIAL AREAS	Quarters 1,2 and 4			Quarter 3		
	a	b	R ²	a	b	R ²
North	9.57097	-1.04303	91.2	10.96668	-1.14412	93.9
Centre	10.83387	-1.15943	93.8	10.30078	-1.10503	90.7
South and the Islands	9.55616	-1.07240	91.1	10.03622	-1.08737	91.9
Italy	11.00738	-1.14963	93.0	11.23708	-1.15500	94.2

Chart 4 - Values of the coefficients a, b and of R² of the functions used for interpolation of the sampling errors of the estimates of absolute frequencies referred to individuals by territorial area – 4-quarter average – Year 2008

TERRITORIAL AREAS	a	b	R ²
North	9.43612	-1.12787	93.0
Centre	9.69583	-1.16485	93.6
South and the Islands	8.67177	-1.08197	91.3
Italy	10.07038	-1.16719	94.5

Chart 5 - Interpolated values of the relative percentage errors of the estimates of absolute frequencies referred to individuals by territorial area - Quarters – Year 2008

ESTIMATES	Quarters 1, 2 and 4				Quarter 3			
	TERRITORIAL AREAS				TERRITORIAL AREAS			
	North	Centre	South and the Islands	Italy	North	Centre	South and the Islands	Italy
50,000	42.4	42.5	35.9	48.9	49.4	43.7	42.1	53.3
60,000	38.6	38.2	32.6	44.0	44.5	39.5	38.2	47.9
70,000	35.6	35.0	30.0	40.3	40.7	36.3	35.1	43.9
80,000	33.2	32.4	27.9	37.3	37.7	33.7	32.6	40.6
90,000	31.2	30.2	26.2	34.9	35.3	31.6	30.6	37.9
100,000	29.6	28.4	24.8	32.8	33.2	29.8	28.9	35.7
200,000	20.6	19.0	17.1	22.0	22.3	20.3	19.8	23.9
300,000	16.7	15.0	13.7	17.5	17.7	16.2	15.9	18.9
400,000	14.3	12.7	11.8	14.8	15.0	13.9	13.6	16.0
500,000	12.8	11.2	10.5	13.0	13.2	12.2	12.0	14.1
750,000	10.3	8.8	8.4	10.3	10.5	9.8	9.7	11.1
1,000,000	8.9	7.5	7.2	8.7	8.9	8.4	8.3	9.4
2,000,000	6.2	5.0	5.0	5.9	6.0	5.7	5.7	6.3
3,000,000	5.0	4.0	4.0	4.6	4.7	4.6	4.5	5.0
4,000,000	4.3	3.4	3.4	3.9	4.0	3.9	3.9	4.2
5,000,000	3.8	2.9	3.0	3.5	3.5	3.4	3.4	3.7
7,500,000	3.1	2.3	2.4	2.7	2.8	2.7	2.8	2.9
10,000,000	2.7	2.0	2.1	2.3	2.4	2.3	2.4	2.5
15,000,000	-	-	-	1.8	-	-	-	2.0
20,000,000	-	-	-	1.6	-	-	-	1.7
25,000,000	-	-	-	-	-	-	-	1.5
30,000,000	-	-	-	-	-	-	-	1.3

Chart 6 - Interpolated values of the relative percentage errors of the estimates of absolute frequencies referred to individuals by territorial area – 4-quarter average – Year 2008

ESTIMATES	TERRITORIAL AREAS			
	North	Centre	South and the Islands	Italy
20,000	42.0	39.8	36.0	47.5
30,000	33.4	31.5	28.9	37.5
40,000	28.4	26.6	24.7	31.7
50,000	25.1	23.4	21.9	27.8
60,000	22.6	21.0	19.9	25.0
70,000	20.7	19.2	18.3	22.9
80,000	19.2	17.8	17.0	21.2
90,000	18.0	16.6	16.0	19.7
100,000	17.0	15.6	15.1	18.6
200,000	11.5	10.4	10.4	12.4
300,000	9.1	8.2	8.3	9.8
400,000	7.8	7.0	7.1	8.3
500,000	6.8	6.1	6.3	7.3
750,000	5.4	4.8	5.1	5.7
1,000,000	4.6	4.1	4.3	4.8
2,000,000	3.1	2.7	3.0	3.2
3,000,000	2.5	2.2	2.4	2.6
4,000,000	2.1	1.8	2.0	2.2
5,000,000	1.9	1.6	1.8	1.9
7,500,000	1.5	1.3	1.5	1.5
10,000,000	1.3	1.1	1.2	1.3
15,000,000	1.0	0.8	1.0	1.0
20,000,000	-	-	-	0.8

Chart 7 - Values of the coefficients a, b and of R² of the functions used for interpolation of the sampling errors of the estimates of totals by groups of estimates, quarter and year, territorial area – Estimates of overnight stays – Year 2008

Overnight stays – work				
TERRITORIAL AREAS	a	b	c	R ²
January-March				
North	53228.04	0.412473	-0.000000040499	95.4
Centre	-5,602.746	0.899343	-0.000000241940	94.0
South and the Islands	14,515.121	0.507661	-0.000000056884	91.4
Italy	120,706.934	0.282019	-0.000000010948	94.8
July-September				
North	50,136.041	0.468442	-0.000000028442	88.3
Centre	26,969.029	0.442985	-0.000000088100	97.1
South and the Islands	29,971.655	0.487099	-0.000000058677	87.9
Italy	108,093.708	0.296477	-0.000000010291	87.5
Year				
North	173,659.03	0.20451225	-0.000000004248	90.6
Centre	100,163.16	0.32046619	-0.000000012395	90.0
South and the Islands	131,926.39	0.28702114	-0.000000006489	90.9
Italy	303,360.33	0.15073356	-0.000000001305	91.7
Overnight stays - holidays				
TERRITORIAL AREAS	a	b	c	R ²
January-March				
North	169,276.799	0.134299	-0.000000001476	92.1
Centre	127,000.415	0.163146	-0.000000004303	88.6
South and the Islands	97,030.631	0.250145	-0.000000005214	73.2
Italy	307,046.685	0.095631	-0.000000000519	86.2
July-September				
North	750,113.562	0.065945	-0.000000000156	86.8
Centre	389,378.857	0.133661	-0.000000000790	87.3
South and the Islands	342,380.294	0.135135	-0.000000000671	88.8
Italy	1,012,770.581	0.054529	-0.000000000067	89.1
Year				
North	930,616.47	0.055077	-0.000000000079	91.3
Centre	483,981.01	0.106572	-0.000000000396	88.3
South and the Islands	507,800.43	0.101978	-0.000000000291	86.7
Italy	1,284,875.31	0.044110	-0.000000000033	91.2
Overnight stays - totals				
TERRITORIAL AREAS	a	b	c	R ²
January-March				
North	202,546.849	0.126640	-0.000000001222	93.3
Centre	161,038.797	0.171766	-0.000000003978	89.0
South and the Islands	91,566.654	0.280308	-0.000000005634	82.5
Italy	360,168.663	0.092930	-0.000000000426	88.2
July-September				
North	797,757.592	0.065073	-0.000000000146	87.7
Centre	401,868.399	0.129540	-0.000000000716	88.8
South and the Islands	376,401.326	0.128174	-0.000000000580	89.5
Italy	1,055,995.436	0.053203	-0.000000000062	90.2
Year				
North	982,169.01	0.054157621	-0.000000000075	91.7
Centre	539,033.29	0.102800977	-0.000000000358	89.3
South and the Islands	601,412.75	0.099648709	-0.000000000258	87.5
Italy	1,399,055.30	0.043152149	-0.000000000030	91.7

Chart 8 - Values of totals corresponding to certain typical values of relative percentage errors by group of estimates, quarter and year, territorial area – Estimates of the number of overnight stays – Year 2008

Overnight stays – work							
TERRITORIAL AREAS	1%	5%	10%	15%	20%	25%	30%
			January-March				
North	10,068,414	9,094,709	7,882,334	6,677,809	5,485,966	4,316,288	3,189,287
Centre	3,669,567	3,503,939	3,296,861	3,089,728	2,882,526	2,675,241	2,467,851
South and the Islands	8,777,772	8,077,108	7,201,965	6,327,878	5,455,346	4,585,240	3,719,216
Italy	25,283,548	21,701,743	17,265,076	12,913,081	8,751,839	5,090,676	2,599,348
			July-September				
North	16,227,336	14,831,171	13,089,002	11,351,625	9,621,559	7,903,400	6,206,396
Centre	4,976,237	4,528,291	3,970,254	3,415,245	2,864,924	2,322,349	1,793,663
South and the Islands	8,193,344	7,517,248	6,673,707	5,832,616	4,995,169	4,163,467	3,341,516
Italy	28,208,588	24,380,349	19,626,321	14,935,995	10,385,713	6,207,923	3,074,202
			Year				
North	46,662,437	37,461,951	26,163,617	15,473,479	6,946,660	2,985,356	1,691,377
Centre	25,366,770	22,185,282	18,230,339	14,317,516	10,489,526	6,862,703	3,785,787
South and the Islands	43,164,736	37,077,385	29,512,101	22,039,821	14,786,494	8,188,577	3,618,567
Italy	109,973,203	80,105,226	44,148,742	15,531,553	5,388,536	2,942,234	1,997,464
Overnight stays – holidays							
TERRITORIAL AREAS	1%	5%	10%	15%	20%	25%	30%
			January-March				
North	85,537,299	59,043,869	27,415,621	6,638,099	2,442,428	1,436,716	1,012,447
Centre	36,402,688	27,373,907	16,467,734	7,171,067	2,635,235	1,369,332	902,395
South and the Islands	46,461,768	38,867,792	29,431,026	20,132,782	11,269,520	4,327,961	1,658,576
Italy	168,439,893	94,167,529	20,472,383	5,371,901	2,900,099	1,975,915	1,496,723
			July-September				
North	372,640,613	137,575,925	20,168,923	8,781,433	5,559,719	4,061,555	3,198,069
Centre	159,637,478	110,377,127	52,078,440	14,150,498	5,508,234	3,274,139	2,315,412
South and the Islands	189,100,421	130,720,272	60,735,219	14,079,919	5,017,783	2,930,531	2,059,462
Italy	682,663,502	160,698,924	21,582,471	10,529,879	6,939,700	5,171,959	4,121,164
			Year				
North	589,990,768	145,231,991	20,010,739	9,725,071	6,399,090	4,765,054	3,794,971
Centre	248,639,619	150,871,845	44,213,344	10,195,993	5,071,201	3,343,505	2,489,433
South and the Islands	321,477,909	187,890,864	45,308,088	9,971,728	5,103,155	3,407,742	2,554,771
Italy	1,065,137,241	127,141,718	22,683,976	12,088,267	8,227,778	6,234,323	5,017,933
Overnight stays – totals							
TERRITORIAL AREAS	1%	5%	10%	15%	20%	25%	30%
			January-March				
North	97,178,171	65,271,347	27,774,472	6,476,777	2,644,530	1,616,052	1,158,895
Centre	41,635,843	31,878,522	20,058,206	9,661,368	3,736,536	1,878,913	1,210,373
South and the Islands	48,311,934	41,269,948	32,501,949	23,810,246	15,314,650	7,535,823	2,646,295
Italy	198,757,525	108,477,059	21,932,920	6,038,572	3,319,968	2,278,947	1,733,171
			July-September				
North	391,462,424	141,862,207	20,998,821	9,246,572	5,875,188	4,299,322	3,388,636
Centre	170,310,390	115,969,892	52,057,347	13,379,556	5,406,592	3,272,495	2,334,671
South and the Islands	207,022,556	139,527,713	59,518,975	12,856,138	5,035,791	3,045,524	2,174,638
Italy	723,103,317	159,227,734	21,930,606	10,834,466	7,171,929	5,356,903	4,274,228
			Year				
North	613,675,010	145,987,195	20,726,196	10,167,329	6,711,426	5,005,560	3,990,287
Centre	265,218,135	157,253,581	42,940,310	10,573,477	5,436,922	3,629,928	2,720,033
South and the Islands	353,820,435	203,738,122	47,588,890	11,290,682	5,903,414	3,972,946	2,990,269
Italy	1,136,838,580	129,844,101	24,296,461	13,045,728	8,904,535	6,757,017	5,443,530

Chart 10 - Values of totals corresponding to certain typical values of relative percentage errors by group of estimates, quarter and year, territorial area – Estimates of the number of trips – Year 2008

TERRITORIAL AREAS	Work trips						
	1%	5%	10%	15%	20%	25%	30%
	January-March						
North	3,230,144	2,752,439	2,159,929	1,577,552	1,020,125	538,244	245,829
Centre	2,101,121	1,888,138	1,623,158	1,360,283	1,100,903	847,844	607,420
South and the Islands	2,691,221	2,361,853	1,951,878	1,545,203	1,145,089	760,466	420,503
Italy	7,809,135	6,076,915	3,950,990	1,975,866	671,065	287,450	173,559
	July-September						
North	2,763,151	2,427,060	2,008,912	1,594,474	1,187,321	796,961	452,674
Centre	2,061,106	1,855,704	1,599,609	1,344,624	1,091,491	841,772	599,237
South and the Islands	1,562,036	1,363,537	1,117,385	875,011	640,138	422,200	244,384
Italy	6,054,370	4,889,602	3,449,474	2,057,752	870,277	308,393	159,238
	Year						
North	12,958,692	9,382,563	5,037,781	1,524,220	456,692	243,947	164,809
Centre	6,943,973	5,551,693	3,837,442	2,206,120	909,721	362,450	202,319
South and the Islands	8,207,784	6,400,813	4,179,898	2,103,620	701,601	291,904	174,351
Italy	26,900,789	15,580,503	3,572,502	782,110	402,889	269,799	202,575
	Holiday trips						
	January-March						
North	20,978,985	14,270,368	6,273,133	1,359,677	511,970	305,601	216,929
Centre	8,229,814	6,672,015	4,744,116	2,874,187	1,245,803	429,937	215,515
South and the Islands	6,410,400	5,093,661	3,474,761	1,944,685	775,650	317,954	182,147
Italy	34,176,522	19,319,265	4,042,023	941,438	497,001	335,982	253,510
	July-September						
North	34,309,532	18,099,500	3,224,966	923,017	516,820	357,577	273,122
Centre	13,984,996	9,869,128	4,938,636	1,394,832	495,186	283,527	197,165
South and the Islands	16,877,994	12,471,352	7,063,882	2,313,184	564,520	276,204	180,606
Italy	61,221,343	22,788,709	2,348,956	954,853	594,581	431,237	338,198
	Year						
North	73,235,000	22,501,486	2,322,742	1,032,568	660,601	485,279	383,413
Centre	29,783,539	16,863,924	3,729,679	924,121	491,370	332,866	251,395
South and the Islands	34,365,359	20,258,242	5,088,960	1,114,877	566,025	376,758	281,975
Italy	124,993,123	15,854,080	2,375,142	1,237,622	835,628	630,569	506,271
	Total trips						
	January-March						
North	22,565,190	15,044,011	6,100,024	1,148,990	449,422	273,250	195,723
Centre	9,216,674	7,343,626	5,032,942	2,824,120	1,075,877	402,429	222,690
South and the Islands	7,780,857	6,085,286	4,002,031	2,053,375	710,849	296,565	176,418
Italy	37,588,769	20,408,189	3,453,051	830,388	449,570	307,158	233,091
	July-September						
North	34,337,546	18,568,553	3,220,712	808,858	440,943	301,999	229,458
Centre	14,125,619	10,026,563	5,088,706	1,416,773	475,088	267,163	184,434
South and the Islands	17,435,269	12,766,641	7,035,591	2,074,123	491,464	245,870	162,395
Italy	61,529,412	23,601,616	1,998,940	772,842	475,536	343,104	268,298
	Year						
North	83,551,263	34,149,466	2,169,393	761,220	458,374	327,660	254,903
Centre	35,942,758	22,423,588	6,614,609	948,347	423,442	270,420	198,387
South and the Islands	43,392,215	28,945,751	11,419,092	1,448,955	512,888	306,523	218,167
Italy	150,102,175	31,258,601	1,765,914	818,951	532,295	394,187	312,958

7. Examples of calculation of sampling errors

7.1. Examples of calculation of sampling errors for estimates of totals referred to trips and overnight stays

Example 1

As seen in the previous paragraph, chart 7 shows the value of the coefficients a, b and c of the functions used for the interpolation of errors with respect to estimates of the number of overnight stays, while chart 9 shows the same coefficients with reference to estimates of the number of trips.

Using the data shown in the charts it is possible to calculate the absolute and relative sampling error of an estimate for a given quarter.

For example, to calculate the absolute sampling error for an estimate belonging to the group of the number of overnight stays referred to Central Italy for the third quarter, ${}_C\hat{Y}_3$, the values of the coefficients a, b and c can be read from chart 7 and the following expression used:

$$\hat{\sigma}({}_C\hat{Y}_3) = 26.969,02 + 0,442985{}_C\hat{Y}_3 - 0,0000000881({}_C\hat{Y}_3)^2.$$

Example 2

The evaluation of sampling errors of estimates can be obtained by approximate method using the data shown in charts 8 and 10. Chart 8 refers to estimates of the number of overnight stays; chart 10 refers to estimates of the number of trips. The charts are divided by quarter and territorial area and present groups of estimates at pre-set sampling error values equal to 1, 5, 10, 15, 20, 25 and 30%.

Considering, for example, chart 8, it can be observed that the value indicated at the point of intersection of the line referring to overnight stays on holiday in Italy for the third quarter and the column referred to an error of 10% indicate that all estimates above 21,582,471 have a relative error below 10%; similarly, all estimates below this value will have a relative error above 10%.

Example 3

By way of further example and to better illustrate the use of chart 8, let us consider the estimate of the number of overnight stays for work referred to the total for Italy in quarter July-September amounting to 14,909,000 (see chart 1.1).

From chart 8, considering the number of overnight stays for work and examining the last line corresponding to the total for Italy in quarter July-September, it can be observed that the value 14,909,000 is within the range of values 14,935,995 and 10,385,713.

It can, therefore, be easily deduced that the value of the corresponding relative percentage error is between 15 and 20%.

7.2. Examples of calculation of sampling errors for estimates of frequencies referred to individuals

Example 1

Chart 2.1 indicates that the total number of people who took trips in the quarter January-March was 14,226,000.

The estimate level closest to 14,226,000 is identified in the first column of chart 5, i.e. that equal to 15,000,000. From this column of the chart, in relation to the first quarter in Italy, the corresponding relative percentage error for the estimate in question can be traced, which is equal to 1.8%.

The absolute error will be:

$$\sigma(14,226,000) = 1.8/100 \times 14,226,000 = 256,068$$

The limits of the confidence interval will be:

$$14,226,000 - (2 \times 256,068) = 13,713,864$$

$$14,226,000 + (2 \times 256,068) = 14,738,136$$

Example 2

Considering the previous estimate, more accurate values of the sampling error can be obtained by linear interpolation of the two consecutive estimate levels within which the value of the estimate in question is contained.

These levels are 10,000,000 and 15,000,000 and have corresponding percentage values of 2.3 and 1.8.

The corresponding error at 14,226,000 is equal to:

$$\sigma(14,226,000) = 2.3 - ((2.3 - 1.8) / (15,000,000 - 10,000,000)) \times (14,226,000 - 10,000,000) = 1.88\%$$

The corresponding absolute error is $1.88/100 \times 14,226,000 = 267,449$ and the limits of the confidence level will be:

$$14,226,000 - (2 \times 267,449) = 13,691,102$$

$$14,226,000 + (2 \times 267,449) = 14,760,898$$

Example 3

The error can be calculated directly by means of the interpolating function (12):

$$\log \hat{\varepsilon}^2({}_d\hat{Y}_t) = a + b \log({}_d\hat{Y}_t)$$

For the estimate of 14,226,000 we have:

$$\log \varepsilon^2 = 11.00738 - 1.14963 \times \log(14,226,000) = -7.92769.$$

From this, the value of ε can easily be deduced by calculating the square root of the antilogarithm in the above expression.

In fact, from $\log(\varepsilon^2) = -7.92769$ we have:

$$\varepsilon^2 = \exp(-7.92769)$$

and hence:

$$\varepsilon = 0.019$$

The relative percentage error will therefore be equal to 1.9 %.