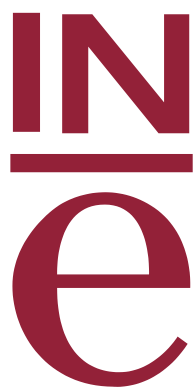


INSTITUTO NACIONAL DE ESTADISTICA



Household Projection Methodology

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1 Introduction

The demand for data on the development of the number, type and composition of households has increased gradually within the last few years. Traditionally the main source for this information are population and dwelling censuses, which are made every ten years. Thus, the last census, 2011, has pointed out not only the extraordinary increase in population due to the massive arrival of foreigners during the last decade, but fundamentally the increase of the number of dwellings and their type.

1.1 THE 2011 CENSUS OF POPULATION AND DWELLINGS

2011 census shows a 14.6% increase of the Spanish population and a 27.5% increase of the number of households since the previous census of 2001. This increase of the last ten years has happened along with an increase of the number of dwellings (20.3%).

The Spanish population has expanded by 6 million people between both censuses. The arrival of foreign people has contributed to this extraordinary population increase. During those ten years foreign population increased by more than three and a half millions, reaching 5.3 millions, which represents 11.2% of the population.

The residential area has also increased between both censuses. The total number of dwellings in Spain in the 2011 census is over 25.2 million, after a 20.3% growth.

However it is worth noting that the sharpest increase has been registered by main dwellings, whose figures have risen almost 4 million (27.5%) and reached 18.1 million.

It is important to take into account that for the census the terms "main dwellings" and "households" are synonyms, as a household is considered to be a group of individuals that live normally in the same dwelling. Therefore the number of households in Spain reached 18,083,692 in November 2011. This figure is significantly higher than the one estimated according to the surveys (for instance, the Economically Active Population Survey estimated a total of 17.4 million households in the last quarter of 2011).

Comparison of dwellings, households and population in 1991, 2001 and 2011

	<u>1990-1991 (*)</u>	<u>2001 (**)</u>	<u>2011 (**)</u>	Absolute growht	Absolute growth	Relative growth	Relative growth
	<u>Census</u>	<u>Census</u>	<u>Census</u>	<u>1990-2001</u>	<u>2001-2011</u>	<u>1990-2001</u>	<u>2001-2011</u>
Dwellings	17,220,399	20,946,554	25,208,623	3,726,155	4,262,069	21.6%	20.3%
Households	11,852,075	14,187,169	18,083,692	2,335,094	3,896,523	19.7%	27.5%
Population	38,872,268	40,847,371	46,815,916	1,975,103	5,968,545	5.1%	14.6%

(*) figures referring to 1st May 1991

(**) figures referring to 1st November

In essence, while population has registered a 14.6% growth in one decade, the number of households has registered a much intense increase (27.5%) and quite sharper than that registered the previous decade (19.7%).

The fact that the household increase is bigger than the population increase has happened during the last few decades: therefore, between the censuses of 1970 and 1980 households increased by 22.14% while population did so by 10.88%, and between 1980 and 1991 the increases were 13.37% and 2.98%, respectively.

Besides, there have been important changes both in the composition and in the size of the households. The average number of household members has decreased significantly during the last 40 years, passing from almost four persons per household in 1970 to 2.58 in 2011.

1.2 THE NEED FOR UPDATED DATA ON THE NUMBER OF HOUSEHOLDS

The statistical system has to try to reflect this new landscape as accurately as possible, and it has to do so without waiting ten years for another census to be made.

Once the results from the last 2011 Population and Dwelling Census are obtained, as it provides all the necessary information about number and composition of the households that make up population referred to November 2011, it is the moment to undertake the challenge of producing updated data on the number of households. This would mean an important advance in the quality of the information produced by the INE.

As there are no other data, usually we turn to household surveys in order to get to know the recent development of the number of households. However one of the problems that are normally related to surveys addressing households is the possible bias that their results might include due to the lack of response of certain types of households that are more difficult to find in their address or to obtain their collaboration. This affects the description of the society and the coexistence ways given by the surveys, and even the number of households they estimate itself, as they can be distorted.

Furthermore, as it happens to population, it is not only necessary to know the recent evolution of the number of households. It is also necessary to carry out a forecasting exercise that would allow showing in advance the mid-term implications of the tendencies noticed currently among the population on the dynamics of creation and dissolution of households. That is the reason why the INE plans the execution of this **Household Projection** new operation.

1.3 2002-2012 INTERCENSUS HOUSEHOLD ESTIMATION

During year 2013 a series of households for the last 2002-2012 intercensus period has been made, in particular from 1st November 2001 to 1st January 2012, which is consistent with the revision of the population figures series carried out with the Population intercensus estimations.

Household surveys have reviewed their result series by using these population figures (intercensus estimations) as an external information source for measuring their results and correcting possible representation errors of their samples. Therefore, during the last year, all the household surveys of the INE (LCS, HBS, ICT-H, EAPS,...) have started to update their population base according to the results provided by the 2011 census but moreover, as an innovation, the measuring has been also included in this household series that has been made up.

This project, therefore, furthers this series of number of households by size with a figure that is always up-to-date and a projection for the next 15 years. Thereby, reference figures on the number of households for each date to consider will be available and they might be used for every survey as an external information source for measuring the results.

This operation was born with the purpose of including little by little in its methodology as many additional information sources and methodological improvements as considered to be convenient, in order to make possible a better identification and measuring of the phenomenon of household composition and evolution. These methodological improvements will be included throughout the next editions and they will be documented for users and researchers knowledge.

2 Objectives

This new statistical operation, **Household Projection**, is included in the *National Statistical Plan 2013-2016* and in the *Statistical Operations Inventory* of the State General Administration. It is designed for providing up-to-date information on the number of households and for giving, every two years, a statistical simulation of the number of future households by type of household that reflects the result that an extension of the currently observed demographic tendencies and social behaviours would have on the above mentioned variable. Also, the results of that operation will be fully consistent with those of the Population Projection that the INE disseminates too, due to the way it is made up.

More specifically, the objectives of the Household Projection statistical operation are;

1. To have information on the evolution of the number of households by size, obtaining household projections built according to the Population Projections and consisting on information for the 15 years next to its publishing. Data will be published **every two years** from 2014 on. Together with the first release the historical series since January 2002 will be provided.

This objective will allow the different social agents to carry out the planning of policies focused on society and based on the expected knowledge of the evolution of coexistence rules.

2. Furthermore, for its use in household surveys measuring, every quarter it is made **an auxiliary projection**, that is not calculated from the population projections but by using the "advanced" population figures (the last provisional figures available in each moment). This makes it possible to have the quarterly updated data corresponding to the number of households existing each month on the province level and its distribution by household size. These quarterly estimations on every month number of households will have provisional nature and will not be published specifically, although their results will appear explicitly in all those surveys that would use them within their measuring (then, for instance, the EAPS will release quarterly data on the number of households).

3 Information sources

In order to prepare de 15 year Household Projection the following basic information sources are taken into account:

1. Population projections from 2014 on.

It would make it possible to have every two years the annual population figures series forecasted for a 15-year period disaggregated by sex, age, nationality and province (see more information on population projections in Annex).

2. 2001 and 2011 Population and Dwelling Census.

It makes it possible to have in every census date the number of households classified by household size and province, as well as the population classified by the size of the household where they belong, age groups, sex, nationality and residence province.

3. Intercensus population estimations for 2002-2012 period.

It includes the monthly population series from January 2002 to January 2012 disaggregated by sex, age, nationality and province.

4. Continuous Register statistics since 2012.

The Continuous Register statistics allows the development of a framework corresponding to main dwellings, from the domiciles listed in the person's individual records.

Despite the information of the Register not being right now accurate enough to make it possible to demarcate the number of occupied dwellings (or households), from it a framework of "occupied" postal addresses can be built. This makes it possible to study the evolution of the number of households by size, as it compares the register data at the beginning of each year with the previous year since 2012. In order to estimate the variation of the tendencies each year, it is used this variation in the number of households classified by size of the household and province as well as the population classified by the size of the household they belong to, age groups, sex and province of residence.

5. Population figures (definitive and advanced) available from 2012 on.

It contains the monthly population series (definitive or advanced) since January 2012 disaggregated by sex, age, nationality and province, but not by the size of the household they belong to. This series is not only available for the total population but also separately for the population living in family dwellings.

6. Continuous Household Survey.

Although its use is not intended for starting right now, the analysis of the results of this survey will provide complementary information that might be used for feeding or conditioning the methodology designed at first.

4 Basic methodology of household projection

The model chosen for preparing household projections is based on the so called propensities method. This method starts by calculating the propensity (probability) of the people from a certain population group, depending on their basic features of sex and age, of belonging to a certain type of household. This propensity is measured by the quotient between the total people belonging to the considered

population group that live in that type of household and the total people of the same population group.

For doing that it is essential to have some basis information that can make it possible to obtain these propensities, such as the information obtained from censuses.

4.1 METHODOLOGY FOR THE INTERCENSUS HOUSEHOLD ESTIMATION 2002-2012

In order to make the intercensus household estimation we take the propensities calculated for 2001 and 2011 censuses, both referring to the 1st November.

These two propensities are taken as limit values of the analysed period; in order to determine the value of propensity at any intermediate moment we have decided to make a linear interpolation between them.

These propensities are applied to the figures of resident population for each time (taken from population intercensus estimations) and an estimation of the number of households of each type is obtained, a result which is consistent with the population figures of the estimated period.

The type of household will be defined depending on its size. The following types of household will be considered:

1. Size 1 household
2. Size 2 household
3. Size 3 household
4. Size 4 household
5. Bigger than size 4 household
6. Household made up by group dwelling residents

The aim is calculating at first the estimation of the number of household for the intercensus period.

In this first estimation the population groups considered are 12 and they correspond to the sex combinations (man, woman), big age groups (aged below 16, from 16 to 64, over 65) and nationality (Spanish, foreigners).

The propensities of belonging to each household type (k) are calculated for the different population groups considered, for both census moments and for each province, by using the formula:

$$PH_{h,s,x,i}(k) = \frac{P_{h,s,x,i}(k)}{P_{h,s,x,i}}$$

Being:

- $PH_{h,s,x,i}(k)$ the propensity of belong to a k household type, of the s sex persons, x age and i nationality in h province.
- $P_{h,s,x,i}(k)$ the population living in a k household type of i nationality, x age and s sex persons in h province.
- $P_{h,s,x,i}$ the resident population of i nationality, x age and s sex persons in h province.

At the same time, the average size of the households bigger than 4 is calculated for each province in the census moments using the quotient between the population living in households bigger than 4 and the no. of households of that size. The average size of group households (type k=6) is calculated the same way.

With this information, propensities and average intercensus sizes are obtained, by linear interpolation with two known endings:

$$PH_{hsxi}^m(k) = PH_{hsxi}^{2001}(k) + \left(\frac{PH_{hsxi}^{2011}(k) - PH_{hsxi}^{2001}(k)}{120} \right) m$$

$$TM_h^m(k) = TM_h^{2001} + \left(\frac{TM_h^{2011} - TM_h^{2001}}{120} \right) m ; k = 5, 6$$

Being:

- $TM_h^m(k)$ the average household size of k type in h province and m month.

And from the calculation of the propensities and average intercensus sizes the number of intercensus households for each size on the 1st of each month for each province is estimated, by applying the population figures corresponding to the population intercensus estimations, using the formula:

$$H_h^m(k) = \frac{\sum PH_{h,s,x,i}^m(k) \cdot P_{h,s,x,i}^m}{TM_h^m(k)}$$

Being:

$H_h^m(k)$ no. of k size households, in h province and m month. Taking into account that for $k = 1, 2, 3$ and 4 is always true when $TM(k) = k$ whatever h y m are.

$P_{h,s,x,i}^m$ the estimated intercensus population figure corresponding to m month, in h province, of i nationality, x age and s sex

The households figure for the total national is obtained by means of the addition of the provinces figures.

As this process has been developed on the basis of census data, whose reference date is 1st November, the monthly interpolation gives also data for the 1st day of each month. Data for the number of households for the half of the corresponding month is calculated with half of the addition of each observation and the next in the

series, and November, August, May and February data can be considered as half-quarter data.

4.2 AUXILIARY HOUSEHOLD PROJECTION: PROPENSITIES EVOLUTION IN THE CONTINUOUS REGISTER

The second step consists on obtaining estimations on the number of households by size for the months after 2011 census, which is known as auxiliary projection, being the procedure the same but with extrapolation of the obtained propensities.

When applying that system it is necessary to include some other restriction or additional hypothesis. A restriction means that the model allows censoring possible negative propensities, for a certain household size, assigning to them value 0 by correcting downwards the propensities of the remaining sizes, in a way proportional to their value, so that the addition of all the propensities for all the sizes equals 1.

The propensities of belonging to collectives and their average size has remained constant from 2011 census on, as, although between 2001 and 2011 censuses the number of persons living in collectives has increased sharply, it has not been due to the increase of propensities but to the increase of individuals aged older.

Furthermore, it has been considered to be more convenient not to extrapolate the propensities taken from 2001 and 2011 censuses for periods after 2011 census, but to re-estimate propensities with a certain frequency (annual or biannual) in order to improve estimations.

This decision has been taken on the light of the evolution of the average size of households that reflect the different surveys. The analysis of these results between 2008 and 2013 for some of them (LCS, EAPS, HBS, ICT-H) or even the data obtained from the Register seem to point out that the decrease of the average household size is not constant throughout time. The Continuous Household Survey has not been included in this analysis as it only offers data for 2013.

The way chosen for making new propensities since January 2012 is the one described below:

From the continuous register the number of persons living in each postal address is determined, as an approximation to the number of households. These figures provide a household structure by size which is not fully comparable to that of the censuses, but the information used is the evolution of that "households" number by size.

From the register on the 1st January, propensities of belonging to the different population groups defined for each household type are calculated for each province, for the two census moments available: on 1st January 2012 and on 1st January 2013. The average size of households bigger than 4 is also calculated for each province in both moments.

The annual variation in propensities between January 2012 and January 2013 is obtained, and with it the monthly evolution of propensities is derived.

Then, the propensities corresponding to 2011 census are taken as the starting structure, and the monthly variation obtained from the register data is applied to as many months as necessary to extend the calculation.

Propensities and average sizes of 5 and more persons households for a m month are calculated this way:

$$PH_{h,s,x}^m(k) = PH_{h,s,x}^{censo2011}(k) \cdot \left(1 + \frac{PHP_{h,s,x}^{2013}(k) - PHP_{h,s,x}^{2012}(k)}{PHP_{h,s,x}^{2012}(k)} \cdot \frac{m}{12} \right)$$

$$TM_h^m(5) = TM_h^{censo2011}(5) \cdot \left(1 + \frac{TMP_h^{2013}(5) - TMP_h^{2012}(5)}{TMP_h^{2012}(5)} \cdot \frac{m}{12} \right)$$

where:

m = number of months since the census date (that is to say, since November 2011)

$PH_{h,s,x}^{censo2011}(k)$, $PHP_{h,s,x}^{2012}(k)$ and $PHP_{h,s,x}^{2013}(k)$ propensities for that group according to 2011 census, register on 1-1-2012 and on 1-1-2013, respectively.

$TM^{censo2011}(5)$, $TMP^{2012}(5)$ and $TMP^{2013}(5)$ the corresponding average sizes of 5 and more persons households.

Afterwards, these propensities and average sizes are applied to the population figures available for each moment (for each m month) and the number of households from November 2011 on is obtained.

$$H_h^m(k) = \frac{\sum PH_{h,s,x}^m(k) \cdot P_{h,s,x}^m}{TM_h^m(k)}$$

being $P_{h,s,x}^m$ the population figures available for the m month in h province for the population group population of s sex and x age.

The population groups considered are 10 and they correspond to the combination of sex (man, woman) and age groups (people aged below 20, from 20 to 39, from 40 to 59, from 60 to 79, over 79). Nationality (Spanish, foreign) is not considered and age is more disaggregated (instead of the 3 big groups there are considered 20-year groups), unlike in intercensus household estimations, as the dynamics of household dissolution and creation is considered to be more related to age differences and as foreign population is fewer, apart from the influence that acquisition of Spanish citizenship processes might have. However, it was verified that the differences between the use of this classification or the use of the intercensus household estimation one were quite slight.

This system has been applied in the obtaining of household monthly data by size and province for 2012 and 2013, and it has been extrapolated for the first half 2014 in order to obtain the quarterly household estimations needed for measuring household surveys. These are data for the total household number and the number of households according to size by province and month, referring to the first day of the month. In order to obtain calibrated data for each mid-term, data referring to the 15th day is also obtained.

Nevertheless, the application of these linear formulas over time produces undesired effects which is necessary to correct. Therefore, the calculation

procedure is modified by using limited exponential type formulas, which use a lower limit for declining propensities and a higher one for upward propensities.

Hence, due to the declining average size of size 5 and more households since these projections are carried out, if a linear tendency is projected over time the average size is below 5. Likewise, propensities of belonging to different size households theoretically should have a value content between 0 and 1, but when calculating long-term propensities by extrapolating them with a linear formula soon there would appear negative propensities for some population group.

By introducing this formulas, it is avoided that the average size of 5 and more persons households might result lower than 5, that declining propensities might become negative and that increasing propensities might reach values which may cause the addition of the propensities of each population group being quite higher than 1, being 1 the theoretical value of that addition.

Moreover, over time we have new registral reference information that allows us to update the recent evolution of propensities. Then, each time that the necessary registral information at 1st January of each t year is available, we update the evolution of registral propensities between year t-1 and year 1 and it is applied to the propensities previously calculated for January t-1 year and the households corresponding to t-1 and t years, and the first half of t+1 year are obtained, although they are not applied in retrospect.

So, once we have the information necessary from the Register on 1-1-2014, the evolution of registral propensities between 2013 and 2014 is updated and it is applied to the propensities that are already calculated for January 2013, with the purpose of obtaining the monthly data of households by size and province for 2013, 2014 and the first semester of 2015.

The formulas used for the calculation of propensities are as follows, being m the number of months since January of year t-1:

- For propensities that, according to the registral reference framework for years t-1 and t, are in decline (that is to say, if $PHP_{h,s,x}^t < PHP_{h,s,x}^{t-1}$ the following is calculated

$$PH_{h,s,x}^m(k) = 0,0001 + \left[\left(PH_{h,s,x}^{t-1}(k) - 0,0001 \right) \cdot \left(\frac{PHP_{h,s,x}^t(k)}{PHP_{h,s,x}^{t-1}(k)} \right)^{\frac{m}{12}} \right]$$

being 0.0001 the lower bound fixed for declining propensities, beginning at t=2014 and changing previously those propensities $PHP_{h,s,x}^{t-1}$ that may result non-existent ($PHP_{h,s,x}^{t-1} = 0$) by a minimum value established at 0.0002 ($PHP_{h,s,x}^{t-1} = 0.0002$).

This formula allows any calculated propensity to have a value of at least 0.0001, which is an arbitrary value chosen in consideration of the minimum propensities calculated from the data of the 2011 census. In this data it can be observed that the propensities of belonging to size 1 households of the persons in the first age group are very low, in particular for the total national it is 0.000965 for men and 0.000931 for women, while by provinces they vary around that value, in such a way that the highest one is 0.00373, there are 6 propensities that are absolute 0 and the lowest existing one is 0.00017.

A non-existing propensity for these population groups would mean that there are not persons aged below 20 years old living on their own. Although nowadays this is not a common thing, it seems to be quite extreme to say that there is not a single case. When projecting all propensities with value 0, the proposed formula assigns value 0 to all the propensity series, and that is why in these cases it is necessary to substitute the non-existing propensity by other arbitrary value in order to make the formula work - the chosen value was 0.0002.

- For propensities that, according to the registral reference framework for years t-1 and t, are in increase (that is to say, if $PHP_{h,s,x}^t > PHP_{h,s,x}^{t-1}$) the following is calculated

$$PH_{h,s,x}^m(k) = LIMITE - \left[(LIMITE - PH_{h,s,x}^{t-1}(k)) \cdot \left(\frac{PHP_{h,s,x}^{t-1}(k)}{PHP_{h,s,x}^t(k)} \right)^{\frac{m}{12}} \right]$$

considering in this case the *LIMIT* as the fewer of the following four values:

$PH_{h,s,x}^{t-1}(k) + C$, in order to avoid that propensities increase too much in the absolute value.

T , in order to avoid always that propensities are higher than a specific value.

$PH_{h,s,x}^{t-1}(k) \cdot M$, in order to avoid that propensities increase too much in the relative value, for instance propensities of belonging to size 1 households of the persons aged below 20 years old are very narrow to 0 but the relative variation between registers may be very high, and moving that long-term evolution might give values which have nothing to do with those of the starting point.

$PH_{h,s,x}^{t-1}(k) + \left(\frac{PHP_{h,s,x}^t(k)}{PHP_{h,s,x}^{t-1}(k)} - 1 \right) \cdot S$, in order to avoid that the exponential formula

that calculates propensities produces huge increases on the long-term.

The values fixed for these formulas are $C = 0.12$, $T = 0.7$, $M = 10$ and $S=10$. They have been determined based on a basis of trials, changing the potential values and proving their operation.

After the calculation of the propensities for the projection period it is necessary to adjust them so that the addition of propensities of all sizes for each population group still equals 1.

- For averages sizes of 5 and more persons households, the formulas used are:

$$TM_h^m(5) = 5,1 + \left[(TM_h^{t-1}(5) - 5,1) \cdot \left(\frac{TMP_h^t(5)}{TMP_h^{t-1}(5)} \right)^m \right]$$

being 5.1 the minimum value for the average size of 5 and more persons households and being m the number of months since January of year t-1 (with values m=0 in January of year t-1, 1, 2, 3,...).

With this formula the average size cannot be lower than 5.1. This value is an arbitrary figure that can be modified, but it seems to be reasonable that it has to be

a bit greater than 5, as that would be the extreme case where there is not a single household of more than 5 members, which does not seem quite likely.

In this formula the exponent of the power is m , unlike the formula used for propensities where it is $m/12$ (no. of months divided between the total months in one year). The only explanation is that in both cases we are trying to reach a reasonable evolution of these variables in such a way that the theoretical series of sizes and propensities have values that are narrow to those obtained at the series starting point and whose evolution is similar to that observed between the registers of the considered years.

Propensities calculated for 2012 and 2013 were applied to final population figures and, from January 2014 on, the figures given are used as quarter preview.

$$H_h^m(k) = \frac{\sum PH_{h,s,x}^m(k) \cdot P_{h,s,x}^m}{TM_h^m(k)}$$

4.3 15 YEAR HOUSEHOLD PROJECTION

In order to carry out this projection (calculating from 2014 with a 15-year projection limit) the method is, at least for the first stage, the same used for household estimations but considering, instead of the advanced population figures, the population obtained in the Population projections for the considered 15-year period.

The designed methodology makes it possible to produce these household projections by type (size). They are based on the corresponding projection of each population group propensity of living in each household type and on the population projections themselves. Therefore, the basis for defining household projection is population projection, but it is also necessary to make hypothesis about the evolution of the propensities.

In turn, as it was already mentioned in the introduction, this operation was born with the purpose of including little by little in its methodology as many additional information sources and methodological improvements as considered to be convenient, in order to make possible a better identification and measuring of the phenomenon of household composition and evolution. These methodological improvements will be incorporated over the course of the next issues, and will be documented for researcher and user knowledge.

Using propensities not by household size but by household type (households made up by couples with or without children, single parent households,...) is an important improvement idea which is not discarded on the mid-term, but right now it is impossible to make simulations with it,....).

The first publishing of household projections will take place in 2014 and will cover a 15-year period, from 2014 to 2029. Every 2 years a new edition will be released, so that the next one will be in 2016 and up to 2031. They data corresponding to a simulation of the total households and of the number of households according to province size and projection year, referring to 1st January of each year.

The first publishing (2014-2029) is obtained thanks to the latest propensities calculated for January 2014 in the auxiliary projection, to which the evolution of the registral framework between 2012 and 2014 is applied. The evolution is not made by linear but exponential extrapolation, using modified exponential functions

(averages sizes of 5 and more persons size households are limited so that they are not smaller than 5, and an upper limit is considered for increasing propensities and a lower limit for declining propensities).

The corresponding population figures, which will be different for quarterly estimations as then they will be projected populations, are applied to the obtained propensities.

The used formulas are as follows, being: $m = 0$ on January 2014, $m = 1$ on February 2014, $m = 180$ on January 2029:

- For the average sizes:

$$TM_h^m(5) = 5,1 + \left[(TM_h^{201401}(5) - 5,1) \cdot \left(\frac{\left(\frac{TMP_h^{2012}(5) + TMP_h^{2014}(5)}{2} \right)^m}{TMP_h^{2012}(5)} \right) \right]$$

- For declining propensities:

$$PH_{h,s,x}^m(k) = 0,0001 + \left[(PH_{h,s,x}^{201401}(k) - 0,0001) \cdot \left(\frac{\left(\frac{PHP_{h,s,x}^{2012}(k) + PHP_{h,s,x}^{2014}(k)}{2} \right)^{\frac{m}{12}}}{PHP_{h,s,x}^{2012}(k)} \right) \right]$$

- For increasing propensities:

$$PH_{h,s,x}^m(k) = LIMITE - \left[(LIMITE - PH_{h,s,x}^{201401}(k)) \cdot \left(\frac{PHP_{h,s,x}^{2012}(k)}{\left(\frac{PHP_{h,s,x}^{2012}(k) + PHP_{h,s,x}^{2014}(k)}{2} \right)^{\frac{m}{12}}} \right) \right]$$

- For households:

$$H_h^m(k) = \frac{\sum PH_{h,s,x}^m(k) \cdot P_{h,s,x}^m}{TM_h^m(k)}$$

being $P_{h,s,x}^m$ the population projected for the m month in h province for the population group population of s sex and x age.

For the next edition (2016-2031) we take as a basis the latest propensities calculated for January 2016 in the auxiliary projection, to which the evolution of the registral framework between 2014 and 2016 is applied. The evolution is made in

the same way, by using modified exponentials, and it is applied to projected population figures.

In the consecutive editions the same procedure is used, that is to say, to the latest propensities calculated in the auxiliary projection for the starting year of the projection it is applied the evolution of the registral framework between the 2 years prior to the beginning of the current edition (which are the same that the 2 years next to the previous edition, as editions are calculated every 2 years). Limited modified exponentials and populations projected for the corresponding period are used.

5 Calendar and dissemination plan

At the end of each quarter the auxiliary household projection for the ending quarter and the next one. This information is necessary for household surveys, in particular for the EAPS. As it has already been said, this projection will not produce a specific publication of results, but this data is actually released, as it appears in the EAPS publication and in other household surveys.

15-year Household Projection will be released every two years, from 2014 on. The first release is intended for September 2014 and it will include, coherent with Population projections, information on province level for years 2014 to 2029.

Initially the publication of one only table is expected. It will include the evolution of the number households on 1st January for each year, for the next 15 years, according to household size (1, 2, 3, 4, over 4 members) by province. These results will be published together with the *population projections*.

With the first publication the historical household series beginning on 1st January 2002 will be released, being those a part of a series with the 2001 census data (on 1st November).