

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)European Journal of Obstetrics & Gynecology and  
Reproductive Biology xxx (2008) xxx–xxx[www.elsevier.com/locate/ejogrb](http://www.elsevier.com/locate/ejogrb)

## Age at sexual initiation and number of sexual partners in the female Spanish population Results from the AFRODITA survey

Silvia de Sanjose<sup>a,\*</sup>, Xavier Cortés<sup>b</sup>, Cristina Méndez<sup>c</sup>, Lluís Puig-Tintore<sup>d</sup>,  
Aureli Torné<sup>d</sup>, Esther Roura<sup>a</sup>, F.Xavier Bosch<sup>a</sup>, Xavier Castellsague<sup>a</sup>

<sup>a</sup> Unit of Infections and Cancer, Cancer Epidemiology Research Program, Catalan Institut of Oncology, Hospitalet del Llobregat, Spain

<sup>b</sup> Gynaecology, Palma de Mallorca, Spain

<sup>c</sup> GlaxoSmithKline, Madrid, Spain

<sup>d</sup> Department of Gynaecology and Obstetrics, Hospital Clínic, Barcelona, Spain

Received 22 April 2007; received in revised form 22 February 2008; accepted 7 April 2008

### Abstract

**Objectives:** The AFRODITA study was designed to describe patterns relating to the number of lifetime sexual partners (SP) and age at first sexual intercourse (AFSI) by geographic region in a representative sample of Spanish women.

**Study design:** A representative sample of the female Spanish population was obtained using the Access Panel Technique. Postal questionnaires were sent to 11,086 women aged 18–70 years. Data were collected on AFSI, number of sexual partners, contraceptive methods, cervical cancer screening and socio-demographic characteristics.

**Results:** The average AFSI was 20.9 years. AFSI below the age of 19 years was reported by 30.8% of the women. Among sexually active women, 70.6% reported being monogamous and 6.4% reported  $\geq 5$  lifetime sexual partners. Younger age at interview was strongly related to earlier AFSI and to higher number of lifetime sexual partners. Women younger than 25 were 39 times more likely to have an AFSI before age 18 than women over age 55. The percentage of women aged less than 25 reporting two or more sexual partners was four times higher than that of women 56 and older. In the multivariate analysis, having two or more sexual partners was independently associated with young age, early AFSI, having ever used oral contraceptives, living in an urban area, having had a screening Pap test in the last 3 years, having a sexually transmitted infection and nulliparity.

**Conclusions:** This study confirms important changes in the sexual behaviour of Spanish women. Younger cohorts show a younger age at sexual initiation and higher number of sexual partners. These are key factors that may induce changes in the human papillomavirus (HPV) prevalence and the cervical cancer incidence in Spain.

© 2008 Elsevier Ireland Ltd. All rights reserved.

**Keywords:** Sexual partners; Age at first sex; Human Papillomavirus; Cervical cancer

Human papillomavirus (HPV) is the most common sexually transmitted infection in the female population [1] and certain types of HPV are now recognized as causal factors in the development of cervical cancer [2]. Sexual intercourse

is the primary route of genital HPV transmission as shown by the similar HPV genotype distribution seen within couples, and the absence or rarity of HPV infection among women that have not had vaginal intercourse [3,4]. Further, HPV infection has been strongly linked to the number of lifetime sexual partners (SP) in addition to other characteristics of sexual behaviour (i.e. male's previous partners, contacts with prostitutes) [5]. Knowledge of patterns of sexual behaviour in a given population can be relevant to understanding the HPV dynamics in that population and to adequately targeting

\* Corresponding author at: Unit of Infections and Cancer, Cancer Epidemiology Research Program, Catalan Institut of Oncology, IDIBELL, CIBERESP, Gran Via s/n km 2.7, 08907 L' Hospitalet de Ll., Barcelona, Spain. Tel.: +34 93 2607812; fax: +34 93 2607787.

E-mail address: [s.sanjose@iconologia.net](mailto:s.sanjose@iconologia.net) (S. de Sanjose).

prevention strategies for cervical cancer. Geographic and cultural variations in the sexual behaviour of women and their partners have been reported to be strongly linked to HPV acquisition in different geographical settings [6–11]. Spain is recognized as having an extremely low prevalence of both HPV and cervical cancer but recent changes in sexual behaviour as a result of migration and less restrictive attitudes towards sex [12,13] may be altering this pattern.

The aim of the current study was to describe characteristics of sexual behaviour in the general female population of Spain.

## 1. Methods

Information on sexual behaviour and screening practices was obtained through mail-out questionnaire. The study subjects derive from the AFRODITA study, a cross-sectional study that included a representative sample of the Spanish female general population aged 18–70 years. The sample was obtained stratified by the 17 Autonomous Regions (referred to hereafter as Region) age, socio-economic level and size of the municipality. Data were obtained between April and May 2005 through postal interviews using the technical Access Panel. This panel allows to obtain a representative sample of the population living in households with the following characteristics:

- The sample provides inclusion of all areas irrespective of its municipality size.
- The sample selects on the basis of all existing household members.
- The sample is framed on an already known structure that has been used for previous studies and which members accept to participate in different studies.

By criteria of confidentiality and to ensure the response of different household members on an individual basis 11,344 questionnaires were nominally sent to every woman aged 18 and 70 years identified in each of the selected households distributed according to socio-demographic variables of the Regions (excluding the Regions of Ceuta and Melilla for logistical reasons) such as habitat sample size, age group and socio-economic class. To provide enough statistical power per Regions and size of habitat, a minimum of 100 interviews was requested. This involved conducting extra interviews in two Regions, Canary Islands and La Rioja. Finally, a total of 11,445 questionnaires were mailed to guarantee a minimal response of 5765 women. 6852 women (60%) replied to the questionnaire.

The final sample did not differ in any of the design variables from that of the original target population. Nonresponders were contacted again, first by post and then, by telephone call. No further follow-up of non-respondents was made after this time.

To measure the economic level of the Spanish families, data were collected for each member on profession and

studies of all household members, general characteristics of the housing (number of rooms, number of bathrooms, etc.), household equipment (video, computer, mobile Internet, domestics, etc.), possession of automobile according cylinder, and possession of second homes. Social grading allocation for a given household was based on a factor analysis including all the above-mentioned parameters that derived in four categories high class + media class, media class, medium low class and low class. Finally, three socio-economic categories were used in the analysis: High, medium (grouping media and medium low) and low.

In addition to socio-demographic characteristics, data were collected on age at first sexual intercourse (AFSI), number of lifetime sexual partners, ever history of sexually transmitted diseases, contraceptive methods used and cervical cancer screening practices.

Continuous variables were evaluated using means and standard deviation. Categorical variables were evaluated using the  $\chi^2$ -test of heterogeneity or by linear test for trend where categories were treated as continuous values. Logistic regression analysis was used to estimate adjusted prevalence odds ratios (POR) and 95% confidence intervals (95% CI) of non-monogamy and of early AFSI, controlling for the effect of potential confounding factors. Linear regression methods were used to evaluate the correlation between behavioral characteristics by Region, controlling for the effect of potential co-variables. The level of significance was set at the standard value of  $\alpha = 0.05$ .

## 2. Results

Table 1 describes several characteristics of the 6852 women included in the study by Region. The average age at interview was 42.2 years (range 18–70); the percentage of virgins was 7.8% (range 3.9–13.7); the mean AFSI was 20.9 years with the lowest value observed in The Canary Islands (19.1 years) and the highest in La Rioja (22.1 years). The Balears and Canary Islands had the highest proportion of women reporting four or more lifetime sexual partners (17.5% and 9.3%, respectively) while Castilla la Mancha and Extremadura had the lowest percentage of women reporting more than four sexual partners (2.5% and 2.1%, respectively). Compared to the overall study population, women reporting no sexual relations were more likely to be younger than 25 years of age (34.1%), to be from a rural area (12.7%) and to be of a lower socioeconomic level (13.2%) (data not shown).

Table 2 provides information on percentage of virgins, mean AFSI and number of sexual partners stratified by age at interview. Mean AFSI decreased significantly ( $p < 0.001$ ) by age with a difference of 5 years between women aged 18 and 25 as compared to those aged 56–70. The percentage of women reporting more than four sexual partners was particularly low among women aged 56–70 (1.2%) and high among women aged 36–35 (10.4%). The AFSI data stratified

Table 1  
Mean age at interview, percentage of virgins, mean age at first sexual intercourse, and number of lifetime sexual partners by Autonomous Region

Autonomous Region	N	Mean age at interview (S.D.)	% virgins	Mean age at first sexual intercourse (S.D.) <sup>a</sup>	% number of lifetime sexual partners <sup>a</sup>		
					Monogamy	2–4	>=5
Andalucía	1028	41.1 (13.0)	9.5	20.8 (3.8)	76.3	19.6	4.1
Aragón	259	42.2 (12.1)	9.0	21.4 (3.4)	74.4	22.5	3.1
Asturias	208	42.0 (12.4)	4.8	20.5 (3.5)	71.6	20.5	7.9
Baleares	128	41.2 (13.1)	6.3	20.2 (4.3)	55.0	27.5	17.5
Canarias	102	42.7 (13.3)	3.9	19.1 (3.2)	57.7	33.0	9.3
Cantabria	101	40.9 (12.8)	4.0	20.2 (3.7)	71.4	22.0	6.6
Castilla, León	626	40.9 (13.4)	11.0	21.1 (3.7)	77.8	17.4	4.7
Castilla, La Mancha	281	41.5 (12.8)	13.4	21.6 (4.0)	80.3	17.2	2.5
Cataluña	1029	44.9 (13.8)	5.4	20.9 (3.5)	62.3	29.5	8.2
Extremadura	220	37.7 (12.3)	13.7	20.8 (3.5)	83.4	14.4	2.1
Galicia	469	40.5 (12.7)	6.9	20.1 (3.6)	67.7	26.4	5.9
Madrid	934	43.3 (13.3)	7.9	21.1 (4.0)	64.8	26.4	8.8
Murcia	165	41.5 (12.4)	7.4	21.2 (4.0)	79.2	16.8	4.0
Navarra	103	42.4 (12.4)	10.7	21.9 (4.3)	76.4	20.2	3.4
País Vasco	365	43.1 (13.2)	5.0	21.4 (3.8)	72.2	21.6	6.2
La Rioja	105	43.1 (13.2)	6.7	22.1 (4.1)	76.3	20.6	3.1
C. Valenciana	729	42.1 (12.9)	5.9	20.7 (3.5)	69.2	22.8	8.0
Total	6852	42.2 (13.2)	7.8	20.9 (3.8)	70.6	23.0	6.4

<sup>a</sup> Among sexually active women.

by age at interview are also represented on a graphical manner in Fig. 1 comparing percentage of women reporting AFSI below age 17; 18–24 and above age 24 and for number of sexual partners lifetime 1, 2–4 or above 4.

The average values of AFSI for Region decreased significantly with increasing proportion of women reporting more than four lifetime sexual partners in the region (R Sq linear unadjusted = 0.324; age adjusted = 0.362;  $p = 0.02$ ; Fig. 2). The percentage of virgins did not contribute significantly to the prediction of regional values of AFSI.

Table 3 summarizes, among sexually active women, the PORs for two indicators: (1) having two or more sexual partners against monogamy and (2) reporting an AFSI earlier than 18 years old against 18 years or more in association with different characteristics. The study population was largely urban (65.5%), with medium socio-economic level (59.3%), likely to use oral contraceptives (55.4%), and largely reported ever use of condoms (68%). A screening cytology in the last 3 years was reported by 73.6% of women, while 15.1% reported never having had a Pap smear. History of an STD was reported by

7.1% and 74.4% had been pregnant. AFSI before age 18 was reported by 7.2% and having more than one sexual partners by 29.7% of the women. The multivariate analysis controlling for these characteristics showed that having more than one lifetime sexual partner was more common among women aged 26–55 years compared to women aged more than 55 years (Table 3). Further, women living in an urban area, ever users of oral contraceptives, ever users of condoms, having had a screening cytology less than 3 years before interview, AFSI earlier than 22 years old, having a history of a sexually transmitted disease and having never been pregnant were all characteristics independently associated with reporting having had more than one sexual partner. Reporting an early AFSI was strongly associated with decreasing age at interview. The likelihood of reporting an AFSI younger than 18 was 39 times higher among those aged 25 years or younger as compared to those aged 56–70. Early AFSI was also significantly more common among never pregnant women, ever users of oral contraceptives and those with a higher number of sexual partners.

Table 2  
Percentage of virgins, mean age at first sexual intercourse, and number of lifetime sexual partners by age at interview

Age at interview	N	Virgins (%)	Age at first sexual intercourse <sup>a</sup> mean (S.D.)	Number of lifetime sexual partners <sup>a</sup> (%)		
				Monogamy	2–4	>=5
18–25	729	34.1	18.2 (1.9)	57.8	35.3	6.9
26–35	1492	7.2	19.8 (3.2)	57.4	32.2	10.4
36–45	2174	3.7	20.3 (3.5)	66.7	25.8	7.6
46–55	1154	3.0	21.4 (3.4)	77.9	17.3	4.8
56–70	1303	5.1	23.8 (4.0)	90.1	8.7	1.2
Total	6852	7.8	20.9 (3.8)	70.6	23.0	6.4

<sup>a</sup> Among sexually active women.

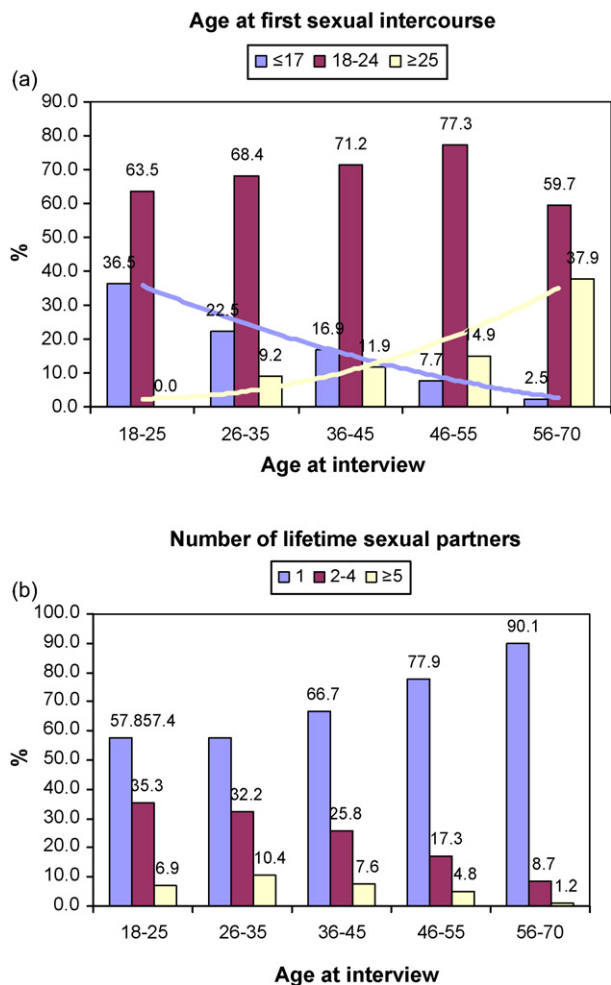


Fig. 1. Percent of women reporting age at first sexual intercourse at ≤16 years old or ≥ than 25 years old (a) and number of sexual partners (b) by age at interview.

### 3. Discussion

This cross-sectional study carried out in a representative sample of the female Spanish population shows that 71% of women describe themselves as monogamous and have their first experience of sexual intercourse at a relatively late age (average AFSI = 20.9 years). The main predictors of variation in these two indicators of sexual behavior were: age at interview, ever use of oral contraceptives and parity. Both AFSI and number of sexual partners were strongly correlated at the individual level and at the regional level. Thus, women with an early AFSI were more likely to report a higher number of sexual partners and vice versa. Regions in which women reported, on average, a higher number of sexual partners, were also more likely to have a lower average AFSI.

Overall, the female population in this study reported a relatively high percentage of monogamy, in contrast with other populations [6,8], but consistent with findings from previous surveys carried out in Spain [12,13]. While, on average, 7 out of 10 women reported being monogamous, this proportion was much lower in the Canary and Balears Islands where around 50% of the population reported having had more than one sexual partner and tended to report an early AFSI. The strongest explanatory factor for these variations was age at interview. Younger cohorts showing an important change in their behavior regarding an increased number of sexual partners and, more particularly an earlier AFSI. Younger women (18–35 years old) were more than five times more likely to report having two or more sexual partners with 6.9% of them reporting more than 4 sexual partners, compared to only 1.2% of women aged 56 years or more who reported having had four or more sexual partners. These observations were not affected by urban or rural residency.

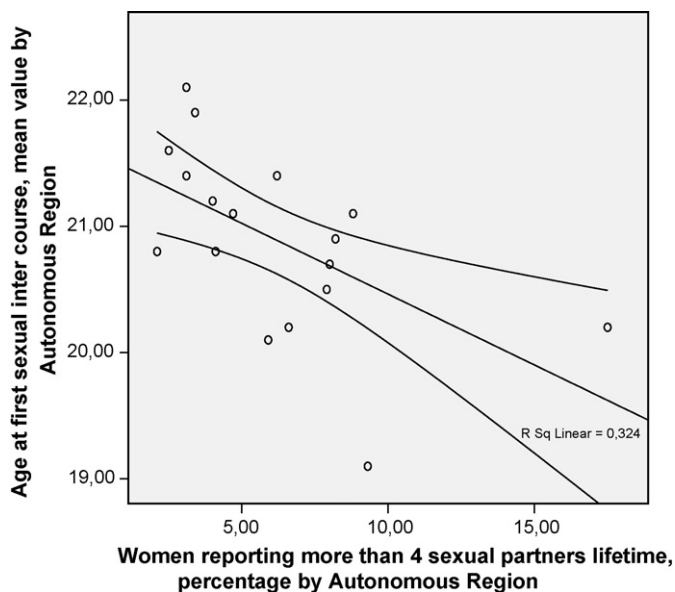


Fig. 2. Correlation between percentage of women reporting more than four sexual partners and average age at first sexual intercourse in the 17 Autonomous Regions. Dots represent Autonomous Region estimates; lines represent the predicted line with 95% CI.

Table 3

Prevalence odds ratios (POR) and 95% confidence intervals (95% CI) of reporting having more than one sexual partner vs. having two or more and an AFSI earlier than 18 vs. 18 or more

Characteristic	N	%	Sexual partners $\geq 2$ vs. 1		AFSI $\leq 17$ vs. $\geq 18$	
			POR*	IC 95%	POR*	IC 95%
Age at interview						
56–70	1093	18.9	1		1	
46–55	1029	17.8	1.50	(1.14, 1.97)	2.29	(1.46, 3.58)
36–45	1941	33.5	2.15	(1.67, 2.76)	4.97	(3.31, 7.47)
26–35	1293	22.3	1.99	(1.51, 2.61)	9.00	(5.91, 13.71)
18–25	433	7.5	0.88	(0.61, 1.26)	38.76	(24.86, 62.95)
Residency						
Rural	1996	34.5	1		1	
Urban	3793	65.5	1.62	(1.42, 1.85)	0.97	(0.82, 1.15)
Socio-economical level						
High	1249	21.6	1		1	
Medium	3435	59.3	0.93	(0.80, 1.09)	1.44	(1.18, 1.75)
Low	1105	19.1	1.02	(0.83, 1.27)	1.27	(0.97, 1.67)
Ever use oral contraceptives						
No	2583	44.6	1		1	
Yes	3206	55.4	1.33	(1.16, 1.54)	1.79	(1.49, 2.15)
Ever use of condoms						
No	1851	32.0	1		1	
Yes	3938	68.0	1.31	(1.12, 1.53)	0.94	(0.77, 1.14)
Screening cytology						
None	876	15.1	1		1	
<3 years	4259	73.6	1.27	(1.03, 1.56)	0.95	(0.73, 1.23)
$\geq 3$ years	654	11.3	1.17	(0.88, 1.55)	0.95	(0.67, 1.35)
AFSI						
$\geq 25$	908	15.7	1			
22–24	1262	21.8	1.36	(1.04, 1.77)		
19–21	1832	31.6	2.63	(2.06, 3.35)		
17–18	1370	23.7	4.62	(3.59, 5.95)		
$\leq 16$	417	7.2	7.82	(5.73, 10.67)	–	–
Sexual partners (Nb)						
1	4070	70.3			1	
2–4	1346	23.3			2.13	(1.79, 2.53)
$\leq 5$	373	6.4	–	–	4.82	(3.71, 6.28)
History of sexually transmitted disease						
No	5377	92.9	1		1	
Yes	412	7.1	2.14	(1.71, 2.69)	1.22	(0.93, 1.60)
Pregnancy						
Ever	4307	74.4	1		2.96	(2.35, 3.73)
Never	1482	25.6	4.07	(3.43, 4.82)	1	
Total	5789					

\* PORs are adjusted for all variables in the table.

Similarly, age at interview was a major determinant of AFSI. Women younger than 25 were 39 times more likely to have an AFSI before age 18 than women over age 55. The average AFSI in the current study is almost 2 years higher than that reported in other European countries [9]. This observation is consistent with Spain being during the last century and in relation to other European countries a conservative, strongly Catholic, and, for many years, fairly isolated country in which sex was socially accepted only within marriage. The data for the

older cohorts are clearly consistent with a later marrying age when marriage and sexual initiation were almost concomitant. From 1900 to 1974, the average age at first marriage ranged between 25 and 27 years [14]. These data are in clear contrast with that from other world regions where average age at sexual initiation can be as low as 15.5 years in Central Africa, or 17.5 years as in many other industrialized societies. The figures for Spain are similar to those reported for Kazakhstan, Uzbekistan, Armenia and The Philippines [15].

The important variation of AFSI by age at interview is in agreement with observations reported in many populations indicating that age at sexual debut appears to decline over time [16,17]. If this age-related pattern is real it is of great relevance as early age at sexual debut is associated to an increased risk of developing invasive cervical cancer independently of number of sexual partners.

Use of oral contraceptives and nulliparity were also related to a higher number of partners and early sexual debut. Ever use of oral contraceptives was reported by 40% of women younger than 25 years of age and by 60% of those in the 26–55 age range compared with only 20% of women older than 55 years. Use of oral contraceptives represents a major benefit to women worldwide as it allows women to control their own fertility. At the same time it may provide a sense of security related to being able to avoid unwanted pregnancies which could explain the higher number of sexual partners among users observed in the data presented here.

Despite its cross-sectional design, this study reflects important sexual behaviour variations across different age cohorts. The fact that only 58% of women younger than 25 years of age were monogamous compared to over 75% of women over age 45 years is indicative of the important social and behavioural changes which have taken place in Spain over the last two decades. If younger generations are having more sexual partners, this may translate into an increase in HPV infections and HPV related lesions. While Spain has previously experienced relatively low rates of invasive cervical cancer affecting around 7 per 100,000 women per year, even in the absence of population-based screening programmes, our data indicates that further preventive strategies may be needed in the near future. Preventive actions should now consider HPV vaccination prior to sexual debut together with regular (3–5 years interval) cytology or HPV detection screen [18,19].

The uptake of screening in the current study was relatively high (over 70%) but still, approximately 13% of sexually active women did not have a regular screening pap suggesting that there is still room for improvement of preventive strategies, particularly among those women who have never had a screening intervention and are thus, at a very high risk of cervical cancer [18].

Women were eligible to participate in this cross-sectional study if they were enrolled on the census and had a household address. Therefore, the participants are drawn from a primarily stable and established population group which clearly under-represents migrant and uncensored populations who may greatly differ in their sexual behavior patterns. Further Ceuta and Melilla were not included and although their population is not big, mortality rates for cervical cancer are the highest in Spain, particularly in Melilla. The study is however, representative of the age, and social structure of a large majority of the Spanish female population. Women completed a postal questionnaire and their answers reflect their personal opinion and judgment of

the question. However, given the type of study no validation of their responses could be undertaken.

Sexual behavior, measured as AFSI and number of sexual partners, varies greatly by age and geographical region in Spain. Both indicators were independently associated with parity and ever use of oral contraceptives, respectively. Age-related variations in sexual behaviour indicators should be taken into account when planning and evaluating preventive strategies for HPV related tumors and for other sexually transmitted diseases in the era of HPV vaccination.

## Acknowledgements

The research was partially funded by an unrestricted grant from GlaxoSmithKline, Spain and the Spanish Ministry of Health CIBERESP. To Lis Ellisson for helpful editing.

## References

- [1] de Sanjosé S, Diaz M, Castellsagué X, et al. Worldwide prevalence and genotype distribution of cervical human papillomavirus DNA in women with normal cytology: a meta-analysis. *Lancet Infect Dis* 2007;7(July (7)):453–9.
- [2] Clifford G, Franceschi S, Diaz M, Muñoz N, Villa LL. Chapter 3: HPV type-distribution in women with and without cervical neoplastic diseases. *Vaccine* 2006;24(Suppl. 3, August (21)):S26–34.
- [3] Kjaer SK, Chackerian B, van den Brule AJ, et al. High-risk human papillomavirus is sexually transmitted: evidence from a follow-up study of virgins starting sexual activity (intercourse). *Cancer Epidemiol Biomarkers Prev* 2001;10(2):101–6.
- [4] Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S. Human papillomavirus and cervical cancer. *Lancet* 2007;370(9590):890–907.
- [5] Castellsagué X, et al., International Agency for Research on Cancer Multicenter Cervical Cancer Study Group. Male circumcision, penile human papillomavirus infection, and cervical cancer in female partners. *N Engl J Med* 2002;346(April 11 (15)):1105–12.
- [6] Vaccarella S, Franceschi S, Herrero R, et al. Sexual behavior, condom use, and human papillomavirus: pooled analysis of the IARC human papillomavirus prevalence surveys. *Cancer Epidemiol Biomarkers Prev* 2006;15(2):326–33.
- [7] Clifford GM, Gallus S, Herrero R, et al. Worldwide distribution of human papillomavirus types in cytologically normal women in the International Agency for Research on Cancer HPV prevalence surveys: a pooled analysis. *Lancet* 2005;366(9490):991–8.
- [8] González C, Ortiz M, Canals J, et al. Higher prevalence of human papillomavirus infection in migrant women from Latin America in Spain. *Sex Transm Infect* 2006;82(June (3)):260–2.
- [9] Wellings K, Collumbien M, Slaymaker E, et al. Sexual behaviour in context: a global perspective. *Lancet* 2006;368(9548):1706–28.
- [10] Bosch FX, Muñoz N, de Sanjose S, et al. Importance of human papillomavirus endemicity in the incidence of cervical cancer: an extension of the hypothesis on sexual behavior. *Cancer Epidemiol Biomarkers Prev* 1994;3(5):375–9.
- [11] Aral SO, Hughes JP, Stoner B, et al. Sexual mixing patterns in the spread of gonococcal and chlamydial infections. *Am J Public Health* 1999;89(6):825–33.
- [12] Encuesta de salud y hábitos sexuales 2003. Instituto Nacional de Estadística. <http://www.ine.es/prodyser/catalogo/indicehabitossexuales.pdf>.
- [13] de Sanjose S, Almirall R, Lloveras B, et al. Cervical human papillomavirus infection in the female population in Barcelona, Spain. *Sex Transm Dis* 2003;30(10):788–93.

- [14] Movimiento de la población catastral de España, 1900–1974. Instituto Nacional de Estadística. Madrid; 2001.
- [15] Sedlock 2002, U.S. Bureau of the Census 1998. Adolescent Reproductive Health: Key Issues. [http://www.rho.org/html/adol\\_keyissues.htm](http://www.rho.org/html/adol_keyissues.htm), 2007.
- [16] Burchell AN, Winer RL, de Sanjose S, Franco EL. Chapter 6: epidemiology and transmission dynamics of genital HPV infection. *Vaccine* 2006;24(Suppl. 3):S52–61.
- [17] Moscicki AB, Schiffman M, Kjaer S, Villa LL. Chapter 5: updating the natural history of HPV and anogenital cancer. *Vaccine* 2006;24(Suppl. 3):S42–51.
- [18] Handbooks of cancer prevention. Cervix cancer screening. Lyon, France: IARC Press; 2005.
- [19] Cutts FT, Franceschi S, Goldie S, et al. Human papillomavirus and HPV vaccines: a review. *Bull World Health Organ* 2007;85(September (9)):719–26.