

Vaccination in the prison population. A review

Sequera VG, Bayas JM.

Preventive Medicine and Epidemiology. Hospital Clínic de Barcelona.

ABSTRACT

From the first day in prison, convicts are exposed to several types of diseases, many of which can be prevented by vaccination. During captivity, the risk of acquiring these types of diseases is known to be higher than outside prison. This increased risk can be explained by structural and logistical factors in prison, as well as by acquired behaviour before and during captivity. Furthermore, for many prisoners captivity is an opportunity to access the health care system and therefore a chance to update their adult vaccination status. The traditional concept suggesting that prisons are primarily designed to ensure public safety should be complemented by this aspect of health, which is a broader approach to public safety.

Key words: vaccination; prisons; communicable diseases; disease prevention; prevalence; immunization; delivery of health care; health education.

Text received: 25-07-2012

Text accepted: 15-09-2012

INTRODUCTION

The vast majority of prisons worldwide are conceived and structured to ensure public safety and not to reduce the incidence of communicable diseases, they are not conceived neither to provide full access of the individual deprived of freedom to the health care system¹⁻². It is also known that a great deal of prisons need external support when the control of some internal epidemiological outbreak is required or in the management of communicable diseases. Often, both national and international recommendation guidelines are poorly applicable to the reality of a penitentiary facility².

The risk of acquiring a communicable disease is extremely high among the imprisoned population if compared to the community where they belong³. Moreover if we consider overcrowded facilities, inadequate sanitation, rotation dynamics among the imprisoned population, together with their social heterogeneity, a high degree of individuals with spread risk behaviours and the high prevalence of communicable diseases itself, there is no denying that the access to vaccination should be appropriately enabled, therefore avoiding the spread and potential complications derived from communicable diseases during their stay in prison and after their release to the community^{2,4}.

After the acknowledgement of the importance and need to clarify concepts in this regard, this article will try to make a revision of the current situation of the risk of vaccine-preventable communicable diseases and pre-exposure recommendations in several prisons worldwide.

VACCINATION NEEDS IN PRISONS

The number of inmates hosted at some point throughout one year in a facility is approximately five times higher than the stable population of the facility, mostly depending of the duration of sentences as well as of transfers⁵⁻⁶. The vast majority of inmates have poorly used the national health system when not deprived of freedom^{4,7,8}. 5.2% of women in North American prisons are pregnant⁹⁻¹⁰. The prevalence of cytological cervix abnormalities is higher than among the general population¹⁰⁻¹¹. 25 % of individuals infected by HIV has been in prison at some point¹²⁻¹³ and there is also an important percentage of inmates with chronic diseases, not necessarily infectious, and a considerable number of individuals over 65 years old, who will need, as well as HIV positive patients, specific vaccination⁴.

The prevalence of illegal drug use in prison ranges between 22 and 48% according to studies based on the reports of inmates themselves in prisons of United Kingdom, Ireland, United States, Brazil or Iran. Intravenous use ranges between 6 and 26 %^{4, 14, 15, 19, 21, and 23}.

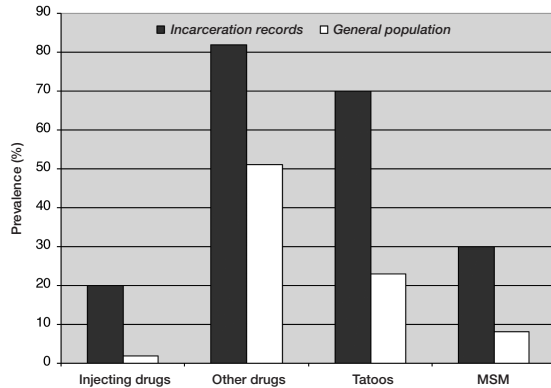


Figure I: Prevalence (%) of risk factors and behaviours related to viral hepatitis among those with a previous record of incarceration and the general population. MSM: Men who have sex with men. United States, 2009²².

The prevalence of viral hepatitis within prison is much higher than in the general population³⁰. In the US 40% of individuals with chronic hepatitis has been imprisoned at some point^{2,9}. With regards to hepatitis B, after several countries have implemented systematic vaccination for this disease in their national vaccination schedules, most of the cases affect adults²⁵ but in countries where this vaccination was included later this disease affects people under 25 years old 4 to 5 times more than those over 35¹⁴. Nevertheless the prevalence of HBV in prisons ranges between 1.8% and 62% worldwide; in Brazil depending on the State it can reach up to 26.4%²⁶⁻²⁸; in Taiwan 21.7%²⁹, 13.9% in UK³¹, 11.3% in Croatia³⁴, 8.7% in Ireland²⁰; 6.1% in Iran³²; 3.9% in Germany³⁵ and 2.6% in Spain³³. This prevalence, as aforementioned, is higher among adult inmates, thus the age is an indicator of accumulative risk, due to a longer exposure period: due to sexual activity or percutaneous exposure¹⁴.

The serological prevalence of HCV in prisons in Spain is 22.7%³³. In the US, in some of its Federal States this figure can be close to 40% of inmates with a similar distribution between male and female inmates^{36,37}. In other countries such as UK, Ghana, Croatia, Iran or Brazil the prevalence reaches 24.2%, 18.7%, 8.3%, 6.1% and 3.1% respectively^{32-34,38-39}. In

all cases it is always higher than in the general population (see figure II).

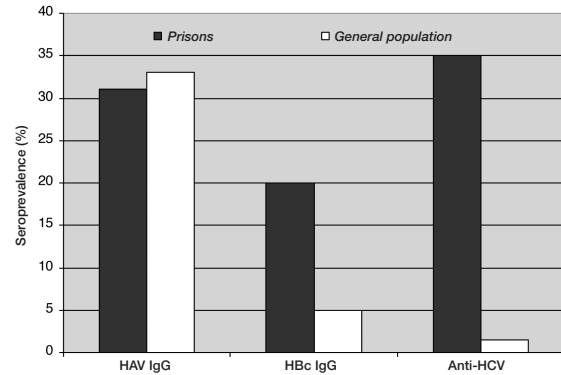


Figure II: Seroprevalence (%) of the exposure to viral hepatitis among the imprisoned and the general population. HAV IgG: hepatitis A IgG antibodies; HBc IgG: hepatitis B core IgG antibodies; anti-HCV: total anti-HCV antibodies. United States, 2009²².

All these features are regarded without considering other aspects such as poor sanitation structural conditions in some of the facilities due to overcrowding or impaired ventilation of cells, sanitary fittings, etc. which must also be considered risk factors related to vaccine preventable communicable diseases.

VACCINES

As with other groups of the adult population, the vaccine status of the imprisoned population should be first updated by providing when necessary the corresponding vaccines such as tetanus, diphtheria, etc.

MMR Immunization

Young adults who have not been vaccinated against MMR (measles-mumps-rubella) should complete this immunization. Although there have been prison outbreaks, serological screening is only recommended for pregnant inmates. The experience gathered in Canada and Switzerland suggests that a dose should be administered specially to young adult immigrant inmates⁶³⁻⁶⁵.

Hepatitis B Vaccination

In the last 20 years the recommendation that the imprisoned population should be immunized against hepatitis B is the only one to have achieved major in-

ternational consensus. Currently the discussion regarding this vaccination concerns mostly the adherence of different facilities to such recommendation, what pattern should be followed and what the right time is to vaccinate those deprived from freedom¹⁻². It has been proved that every dollar invested in this vaccination saves 2.13 dollars of potential treatment and care derived expenses⁴⁰. Despite this consensus, a lot of prisons (federal prisons) in United States do not systematically provide this vaccine⁴¹. In France for the last three years “the last barriers are being broken down”⁴³ to provide universal vaccination in all prisons. Vaccination schedule against HBV in Spanish prisons, which was implemented over 20 years ago and where serological screening is previously carried out, still remains in force and has good results^{33,44-45}.

In countries with average and poor income this vaccination-despite some interesting experiences- is far from being systematically implemented^{14,30,32}.

The most commonly used immunization schedule is 0, 1-2 and 6 months, since it is the one to have proved better sero-conversion⁴⁵. International recommendations suggest that a short schedule (0, 1 and 2 months) should be adopted mainly due to the dynamics of the type of population⁴⁶⁻⁴⁷. In England accelerated schedules are being implemented (0, 7, 21 days and 12 months)⁴⁸. Post-vaccination serological determination is not recommended.

Hepatitis A Vaccination

There are few reports on HAV outbreaks in prisons^{15,49} and HAV immunization is generally not recommended for all those deprived from freedom, it is only recommended –like the general population- for men who have sex with men⁴⁹⁻⁵⁰ and for those with risk factors which could entail complications such as fulminant hepatic failure or even death. This would be the case of illegal drug users- whether injecting or not- patients infected by HIV, HCV, or those suffering from some chronic hepatic disease^{47,51-52}. All these features are difficult to identify without serological testing and self-reporting upon imprisonment.

The recommended vaccination schedule is 0 and 6 months and the level of antibodies created after the first dose is over 90%, yet a system should be implemented so that the second dose is granted whether inside prison or in the community².

Some studies suggest that the combined Hepatitis A and B vaccine should be administered with the pattern 0, 1-2 and 6 months, but the estimated expense derived from its implementation could be high^{49,53}.

Seasonal Influenza Vaccination

The main objective of seasonal influenza vaccination is to reduce the risk of complications among old adults, those with chronic pathologies, immunosuppression of any kind and pregnant women^{2,54}. After several outbreaks in prison being described, this measure is recommended for all those hosted within⁵⁵⁻⁵⁶. The estimation of cost-benefit of influenza vaccination in the imprisoned population is higher than not vaccinating such population⁵⁷. Despite this fact, over half of the prisons in United States did not provide seasonal influenza vaccination during the 2009 pandemic⁵⁸. European recommendations still do not include routine influenza vaccination every year for all those hosted in prisons.

Varicella (Chickenpox) Vaccination

Vaccination against VZV is recommended for all the imprisoned population who is not already immunized^{2,59}. The experiences of prison outbreaks both in Italy and Switzerland concluded that serological screening is not necessary for vaccination, and that self reports of having had chickenpox had a positive predictive value of over 90% and can be safely used to decide the administration of the vaccine when indicated⁶⁰⁻⁶².

Human Papillomavirus Vaccination

Both in Canada and in the US over half of the prisons offer this vaccine for women for whom it is indicated⁶⁶⁻⁶⁸. There are no specific European recommendations to this regard.

OTHER CONSIDERATIONS

23-valent pneumococcal vaccination and meningococcal C vaccination (which is already observed by prison vaccination schedules in England) must be recommended for inmates according to their belonging to specific risk groups with precise indication⁴⁸.

In the United Kingdom one of the quality indicators of prison health care is that over 80% of inmates be immunized against HBV 30 days after imprisonment⁶⁹. Yet there is controversy regarding whether offering immunization immediately after imprisonment is the most appropriate strategy since the mood and anxiety of those who have just been imprisoned may alter the adherence to vaccination. Vaccination is

less likely to be refused if continuously offered after imprisonment, when the attitude of the inmate may be different and the environment can seem more familiar¹.

A considerably important group of the population lives and works in prison. If immunization in prison is conceived as a preventive intervention strategy with a "high risk" approach, this opportunity — sometimes the only one for these people to access a healthcare system— must count upon a permanent and active vaccination schedule. First the vaccination schedule recommended for adults should be completed and after immunization against the inherent risks of imprisonment should be provided. This is how the prevention of communicable diseases among the imprisoned population, among its staff and even their families and the community will be enforced, therefore benefitting the whole general health system. Therefore, including prisons in a public healthcare plan can considerably enable the control of preventable infections to all the population through vaccination⁵⁶.

CORRESPONDENCE

José María Bayas Rodríguez
Servicio de Medicina Preventiva y Epidemiología.
(Preventive Medicine and Epidemiology)
Hospital Clínic de Barcelona.
C/ Villarroel 170
08036 Barcelona, España.
Correo electrónico: jmbayas@clínic.ub.es

BIBLIOGRAPHICAL REFERENCES

1. Viswanathan U, Beaumont A, O'Moore E, Ramsay M, Tedder R, Ijaz S, et al. Hepatitis B transmission event in an English prison and the importance of immunization. *J Public Health (Oxf)*. 2011 Jun; 33(2): 193-6.
2. Bick JA. Infection control in jails and prisons. *Clin Infect Dis*. 2007 Oct 15; 45(8): 1047-55.
3. Centers for Disease Control and Prevention. Transmission of hepatitis B virus in correctional facilities-Georgia, January 1999-June 2002. *MMWR Morb Mortal Wkly Rep* 2004; 53: 78-81.
4. Moller L, Stöver H, Jürgens R, Gatherer A, Nikogosian H. Health in prisons. A WHO guide to the essentials in prison health. WHO Regional Office for Europe. 2007.
5. Spaulding AC, Seals RM, Page MJ, Brzozowski AK, Rhodes W, Hammett TM. HIV/AIDS among inmates of and releasees from US correctional facilities, 2006: declining share of epidemic but persistent public health opportunity. *PLoS One* 2009; 4:e7558.
6. Goldenson J, Hennessey M. Correctional health care must be recognized as an integral part of the public health sector. *Sex Transm Dis*. 2009 Feb; 36(2 Suppl): S3-4.
7. McGuire J, Rosenheck RA, KasproW WJ. Health status, service use, and costs among veterans receiving outreach services in jail or community settings. *Psychiatr Serv* 2003; 54: 201-7.
8. Hatton DC, Kleffel D, Fisher AA. Prisoners' perspectives of health problems and healthcare in a US women's jail. *Women Health* 2006; 44: 119-36.
9. Oosterwijk J. 2009-2010 national jail and adult detention directory. 11th ed. Baltimore, MD: American Correctional Association; 2009.
10. Bickell NA, Vermund SH, Holmes M, Sayfer S, Burk RD: Human papillomavirus, gonorrhoea, syphilis, and clinical dysplasia in jailed women. *Am J Public Health* 1991; 81: 1318-20.
11. Thorburn KM. Health Care in Correctional Facilities. *West J Med* 1995; 163: 560-4.
12. Hammett TM, Harmon MP, Rhodes W. The burden of infectious disease among inmates of and releases from US correctional facilities, 1997. *Am J Public Health* 2002; 92: 1789-94
13. Spaulding A, Stephenson B, Macalino G, Ruby W, Clarke JG, Flanigan TP. Human immunodeficiency virus in correctional facilities: a review. *Clin Infect Dis*. 2002 Aug 1; 35(3): 305-12.
14. Stief AC, Martins RM, Andrade SM, Pompilio MA, Fernandes SM, Murat PG, et al. Seroprevalence of hepatitis B virus infection and associated factors among prison inmates in state of Mato Grosso do Sul, Brazil. *Rev Soc Bras Med Trop*. 2010 Sep-Oct; 43(5): 512-5.
15. Vong S, Fiore AE, Haight DO, Li J, Borgsmiller N, Kuhnert W, et al. Vaccination in the county jail as a strategy to reach high risk adults during a community-based hepatitis A outbreak among methamphetamine drug users. *Vaccine*. 2005 Jan 11; 23(8): 1021-8.
16. Vescio MF, Longo B, Babudieri S, Starnini G, Carbonara S, Rezza G, et al. Correlates of hepatitis C virus seropositivity in prison inmates: a meta-analysis. *J Epidemiol Community Health*. 2008 Apr; 62(4): 305-13.

17. Hellard ME , Aitken CK , Hocking JS. Tattooing in prisons - not such a pretty picture . *Am J Infect Control* 2007; 35: 477-80.
18. Hellard ME , Hocking JS. The prevalence and the risk behaviours associated with the transmission of hepatitis C virus in Australian correctional facilities. *Epidemiol Infect* 2004; 132: 409-15.
19. Fox RK, Currie SL, Evans J, Wright TL, Tobler L, Phelps B, et al. Hepatitis C virus infection among prisoners in the California state correctional system. *Clin Infect Dis*. 2005 Jul 15; 41(2): 177-86.
20. Allwright S, Bradley F, Long J, Barry J, Thornton L, Parry JV. Prevalence of antibodies to hepatitis B, hepatitis C, and HIV and risk factors in Irish prisoners: results of a national cross sectional survey. *BMJ*. 2000 Jul 8; 321(7253): 78-82.
21. Azarkar Z, Sharifzadeh G. Evaluation of the Prevalence of Hepatitis B, Hepatitis C, and HIV in Inmates with Drug-Related Convictions in Birjand, Iran in 2008. *Hepat Mon*. 2010 Winter; 10(1): 26-30.
22. Hunt DR, Saab S. Viral hepatitis in incarcerated adults: a medical and public health concern. *Am J Gastroenterol*. 2009 Apr; 104(4): 1024-31.
23. Zamani S, Farnia M, Torknejad A, Alaei BA, Gholizadeh M, Kasraee F, et al. Patterns of drug use and HIV-related risk behaviors among incarcerated people in a prison in Iran. *J Urban Health*. 2010 Jul; 87(4): 603-16.
24. Harawa NT, Sweat J, George S, Sylla M. Sex and condom use in a large jail unit for men who have sex with men (MSM) and male-to-female transgenders. *J Health Care Poor Underserved*. 2010 Aug; 21(3): 1071-87.
25. Centers for Disease Control and Prevention. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: immunization of adults. *MMWR Morb Mortal Wkly Rep* 2006; 55(RR16): 1-25.
26. Martelli CMT, Andrade ALLS, Cardoso DDP, Sousa LCS, Silva SA, Sousa MA, et al. Soroprevalencia e fatores de risco para a infeccao pelo virus da hepatite B pelos marcadores AgHBs e anti-HBs em prisioneiros e primodoadores de sangue. *Rev Saude Publica* 1990; 24: 270-6.
27. Fialho M, Messias M, Page-Shafer K, Farre L, Schmalb M, Pedral-Sampaio D, et al. Prevalence and risk of blood-borne and sexually transmitted viral infections in incarcerated youth in Salvador, Brazil: opportunity and obligation for intervention. *AIDS Behav* 2008; 12 (suppl 4): S17-24.
28. Coelho HC, Oliveira SAN, Miguel JC, Oliveira MLA, Figueiredo JFC, Perdona GC, et al. Soroprevalencia da infeccao pelo virus da hepatite B em uma prisao brasileira. *Rev. Bras. Epidemiol* 2009; 12: 124-31.
29. Lin CF, Twu SJ, Chen PH, Cheng JS, Wang JD. Prevalence and determinants of hepatitis B antigenemia in 15,007 inmates in Taiwan. *J Epidemiol*. 2010; 20(3): 231-6.
30. Tanaka J. Hepatitis B epidemiology in Latin America. *Vaccine* 2000; 18: 17-9.
31. Weild AR, Gill ON, Bennett D, Levingstone SJM, Parry JV, Curran L. Prevalence of HIV, hepatitis B, and hepatitis C antibodies in prisoners in England and Wales: a national survey. *Commun Dis Public Health* 2000; 3: 121-6.
32. Javadi AA, Avijgan M, Hafizi M. Prevalence of HBV and HCV infections and associated risk factors in addict prisoners. *Iranian J Publ Health* 2006; 35: 33-6.
33. Esteban Mur R, Cañada JL, Sureda-Barbosa M, Ripoll MA, Sáiz de la Hoya P. Orientaciones para un mejor manejo de la hepatitis B en España *Rev Esp Sanid Penit* 2009; 11: 87-95.
34. Burek V, Horvat J, Susić E, Mikulić R. Prevalence of hepatitis B and C among prison population in Croatia. *Acta Med Croatica*. 2009 Dec; 63(5): 447-50.
35. Decker MD, Vaughn WA, Brodie JS, Hutcheson RH, Schaffner W. Seroepidemiology of hepatitis B in Tennessee prisoners. *J Infect Dis* 1984; 150: 450-9.
36. Ruiz JD, Molitor F, Sun RK, Mikanda J, Facer M, Colford JM Jr, et al. Prevalence and correlates of hepatitis C virus infection among inmates entering the California correctional system. *West J Med*. 1999 Mar; 170(3): 156-60.
37. Gough E, Kempf MC, Graham L, Manzanero M, Hook EW, Bartolucci A, et al. HIV and hepatitis B and C incidence rates in US correctional populations and high risk groups: a systematic review and meta-analysis. *BMC Public Health*. 2010 Dec 21; 10: 777.
38. Kirwan P, Evans B. Sentinel Surveillance of Hepatitis Testing Study Group, Brant L. Hepatitis C and B testing in English prisons is low but increasing. *J Public Health (Oxf)*. 2011 Jun; 33(2): 197-204.
39. Adjei AA, Armah HB, Gbagbo F, Ampofo WK, Quaye IK, Hesse IF, et al. Correlates of hepatitis C virus infection among incarcerated Ghanaians:

- a national multicentre study. *J Med Microbiol.* 2007 Mar; 56(Pt 3): 391-7.
40. Pisu M, Meltzer MI, Lyerla R. Cost-effectiveness of hepatitis B vaccination of prison inmates. *Vaccine* 2002; 21(3-4): 312-21.
 41. Charuvastra A, Stein J, Schwartzapfel B, Spaulding A, Horowitz E, Macalino G, et al. Hepatitis B vaccination practices in state and federal prisons. *Public Health Rep.* 2001 May-Jun; 116(3): 203-9.
 42. Saum CA, Surratt H, Inciardi JA, Bennett RE. Sex in prison: exploring the myths and realities. *Prison J* 1995; 75: 413-31.
 43. Carrieri MP, Rey D, Michel L. Universal hepatitis B virus vaccination in French prisons: breaking down the last barriers. *Addiction.* 2010 Jul; 105(7): 1311-2.
 44. Saiz de la Hoya P, Marco A, García-Guerrero J, Rivera A; Prevalhep study group. Hepatitis C and B prevalence in Spanish prisons. *Eur J Clin Microbiol Infect Dis.* 2011 Jul; 30(7): 857-62.
 45. Bayas JM, Bruguera M, Martin V, Vidal J, Rodes J, Salleras LY. Hepatitis B vaccination in prisons: the Catalanian experience. *Vaccine.* 1993 Nov; 11(14): 1441-4.
 46. Awofeso N. Hepatitis B vaccination in prisons. *Bull World Health Organ.* 2002; 80(7): 569-74.
 47. Centers for Disease Control and Prevention. Prevention and Control of Infections with Hepatitis Viruses in Correctional Settings. *MMWR Morb Mortal Wkly Rep* 2003; 52(RR01): 1-33.
 48. Afza M. Schedule for vaccination of prisoners and young offenders in South Staffordshire. *Stafford: Health Protection Agency West Midlands North*; 2008.
 49. Gondles EF. A call to immunize the correctional population for hepatitis A and B. *Am J Med.* 2005 Oct; 118 Suppl 10A: 84S-89S. PubMed PMID: 16271547.
 50. Storholm ED, Fisher DG, Reynolds GL, Napper LE, Morrissey TA, Kochems LM. Hepatitis vaccination of men who have sex with men at gay pride events. *Prev Sci.* 2010 Jun; 11(2): 219-27.
 51. Levy IG, Gemmill I, Ellis EC. Hepatitis A among men in a Canadian correctional facility. *Can Commun Dis Rep* 1993; 19(3): 17-21.
 52. Skidmore S, Parry JV, Nottage P. An investigation of the potential risk of an HAV outbreak in a prison population following the introduction of cases from a community outbreak. *Commun Dis Public Health* 2001; 4(2): 133-5.
 53. Jacobs RJ, Rosenthal P, Meyerhoff AS. Cost effectiveness of hepatitis A/B versus hepatitis B vaccination for US prison inmates. *Vaccine.* 2004 Mar 12; 22(9-10): 1241-8.
 54. National Health and Medical Research Council. *The Australian Immunisation Handbook.* Canberra: AGPS; 2000. p. 143-5.
 55. Centers for Disease Control and Prevention (CDC). Influenza outbreaks at two correctional facilities - Maine, March 2011. *MMWR Morb Mortal Wkly Rep.* 2012 Apr 6; 61(13): 229-32.
 56. Glaser JB, Greifinger RB. Correctional health care: a public health opportunity. *Ann Intern Med.* 1993 Jan 15; 118(2): 139-45.
 57. Nichol KL, Mallon KP, Mendelman PM. Cost-benefit of influenza vaccination in healthy, working adults: an economic analysis of a clinical trial of trivalent live attenuated influenza virus vaccine. *Vaccine* 2003; 16: 2216-26.
 58. Centers for Disease Control and Prevention (CDC). Receipt of A(H1N1)pdm09 vaccine by prisons and jails - United States, 2009-10 influenza season. *MMWR Morb Mortal Wkly Rep.* 2012 Jan 6; 60(51-52): 1737-40. Erratum in: *MMWR Morb Mortal Wkly Rep.* 2012 Jan 27; 61(3): 57.
 59. Federal Bureau of Prisons Clinical Practice Guideline. Management of Varicella Zoster Virus (VZV) Infections. Washington: U.S. Department of Justice; 2011.
 60. Gétaz L, Siegrist CA, Stoll B, Humair JP, Scherrer Y, Franziskakis C, et al. Chickenpox in a Swiss prison: susceptibility, post-exposure vaccination and control measures. *Scand J Infect Dis.* 2010 Dec; 42(11-12): 936-40.
 61. MacMahon E, Brown LJ, Bexley S, Snashall DC, Patel D. Identification of potential candidates for varicella vaccination by history: questionnaire and seroprevalence study. *BMJ* 2004; 329: 551-2.
 62. Valdarchi C, Farchi F, Dorrucchi M, De Michetti F, Paparella C, Babudieri S, et al. Epidemiological investigation of a varicella outbreak in an Italian prison. *Scand J Infect Dis.* 2008; 40(11-12): 943-5.
 63. Leads from the MMWR. Rubella outbreaks in prisons-New York City, West Virginia, California. *JAMA.* 1985 Nov 1; 254(17): 2387-8.
 64. Testa A. Spot on: measles and prison. *Infection Inside.* 2006; 2(2).
 65. Sprauer MA, Markowitz LE, Nicholson JK, Holman RC, Deforest A, Dales LG, et al. Response of human immunodeficiency virus-infected adults to measles-rubella vaccination. *J Acquir Immune Defic Syndr.* 1993; 6(9): 1013-6.

66. Henderson CE, Rich JD, Lally MA. HPV vaccination practices among juvenile justice facilities in the United States. *J Adolesc Health*. 2010 May; 46(5): 495-8.
67. Tedeschi SK, Bonney LE, Manalo R, Mayer KH, Shepardson S, Rich JD, et al. Vaccination in juvenile correctional facilities: state practices, hepatitis B, and the impact on anticipated sexually transmitted infection vaccines. *Public Health Rep*. 2007; 122(1): 44-8.
68. Binswanger IA, Mueller S, Clark CB, Cropsey KL. Risk factors for cervical cancer in criminal justice settings. *J Womens Health (Larchmt)*. 2011 Dec; 20(12): 1839-45.
69. Department of Health. Prison Health Performance and Quality Indicators: Guidance Notes [Internet]. London: Department of Health; 2008 [cited 2012 jun 21]. Available from: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_097117.pdf