Cervical Dysplasia & Cervical Cancer
Age- and Ethnic Distribution in the Republic of Suriname

Thesis submitted in partial fulfilment of the requirements for the degree of Master of Public Health

Euridice R.Irving
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Acknowledgements

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<td>ABS</td>
<td>General Bureau of Statistics Suriname</td>
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<td>ACCP</td>
<td>Alliance for Cervical Cancer Prevention</td>
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<tr>
<td>BOG</td>
<td>Bureau of Public Health</td>
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<tr>
<td>CIN</td>
<td>Cervical Intraepithelial Neoplasia</td>
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<td>CIS</td>
<td>Carcinoma in situ</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>HPV</td>
<td>Human Papilloma Virus</td>
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<td>HSIL</td>
<td>High-grade squamous intraepithelial lesion</td>
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<td>IARC</td>
<td>International Agency for Research on Cervical Cancer</td>
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<tr>
<td>LSIL</td>
<td>Low-grade squamous intraepithelial lesion</td>
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<td>PAHO</td>
<td>Pan American Health Organization</td>
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<tr>
<td>Pap</td>
<td>Papanicolau</td>
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<td>SD</td>
<td>Standard deviation</td>
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<td>STI</td>
<td>Sexually Transmitted Infection</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>VIA</td>
<td>Visual Inspection with Acetic Acid</td>
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<td>WHO</td>
<td>World Health Organization</td>
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“Cervical cancer is fully preventable and curable at low cost and at low risk, when screening to facilitate the timely detection of early precursor lesions in asymptomatic women is available together with appropriate diagnosis, treatment and follow-up.” (Lewis, 2004)
Abstract

Cervical cancer was once one of the most common cancers in large parts of the world. However, since the gradual introduction in 1947 of the cytological examination for its early detection, the incidence of this malignancy has dramatically declined in developed countries. Despite these improvements, cervical cancer is still a major cause of morbidity and mortality in developing countries. Cervical dysplasia or cervical intraepithelial neoplasia (CIN) is a term for a continuum of epithelial lesions of the cervix uteri ranked in three grades based on increasing degrees of cellular change and disorganization. The development of cancer from CIN can take decades, which is the precise reason why this type of cancer is worth screening for. This thesis focuses on the occurrence and the age and ethnic distribution of cervical dysplasia and cervical cancer in Suriname, with additional attention to cervical cancer mortality.

This was a retrospective, descriptive and exploratory study to relate data on the age and ethnic distribution of cervical dysplasia to those on the age and ethnic distribution of cervical cancer and the age and ethnic distribution of cervical cancer deaths in Suriname. Information about the dysplasia lesions (2554 records) was available from the Lobi Foundation for the period 1995 to 2006, for the malignant neoplasms (1117 records) from the Pathology Department from the Academic Hospital for 1980 to 2008, and for cervical cancer mortality (283 records) from the Bureau of Public Health for 1995 to 2010. The occurrence was represented by absolute numbers and incidence rates per 100,000 population, the age distribution by proportions per 10-year age groups and for the ethnic distribution ethnic-specific rates were calculated and compared using rate ratios within 95% confidence intervals and for p-values < 0.05. For evaluating statistical significance, the Chi-square test, and ANOVA were used.

The results show that cervical dysplasia is distributed according to international patterns with an occurrence of 1.7% for all lesions and for CIN 1, CIN 2 and CIN 3/CIS 1, 0.5 and 0.3%, respectively. With an average national screening coverage of 7%, these estimates represent an underestimation of the true values. The average cervical cancer incidence was 24 per 100,000 and the average mortality rate was 10 per 100,000, classifying Suriname as a high-risk country. The high-risk groups for all cervical dysplasia lesions, cervical cancer and mortality were 30-49 (64-71%), 30-59 (60%) and the 60-79 age groups (40%), respectively. When
exploring the mean age of all premalignant and malignant cervical lesions, the women with
cancer were significantly older than those with dysplasia. Excess risk for cervical cancer and
cervical cancer deaths were the Indigenous and Creole women. The Maroon women showed
the lowest rates for both cervical cancer and mortality due to cervical cancer, compared to all
other ethnic subpopulations.

It was concluded that current screening practices in Suriname to date have very limited impact
on the incidence and mortality of cervical cancer. Identified high-risk groups according to age
justify adjusting the target population for screening to women aged between 30 and 49.
Furthermore, special attention should be given to the Indigenous and Creole women, who
have an excess risk for developing cervical cancer and death due to cervical cancer.
Introduction

Background Information

The Problem of Cervical Cancer

Cervical cancer was once one of the most common cancers in large parts of the world. However, since the gradual introduction in 1947 of the cytological examination for its early detection, the incidence of this malignancy has dramatically declined in many countries. The exam is based on the fact that neoplastic cells are less attached than normal cells and shed more easily. These cells can then be collected and evaluated for characteristics of anaplasia, i.e., signs of malignancy (Koss, 1989).

The cytological examination referred to as the Papanicolaou (Pap) smear has remained the most successful screening tool for cancer ever developed. This test can detect precursor epithelial changes - called cervical dysplasia or cervical intraepithelial neoplasia (CIN) - long before visible abnormalities appear on the epithelium of the cervix uteri. Notably, virtually all cervical cancers arise from such precursor lesions (Montag & Kumar, 2007).

The USA represents a striking example of the success of a well-organized and comprehensive cytology-based screening program. The mortality due to uterine (particularly cervical) cancer has declined from more than 30 to less than 10 per 100,000 population since the introduction of the Pap test (Jemal et al., 2009). Indeed, during the last decades, the absolute numbers of new cervical cancer cases and deaths have stabilized around 12,000 and 4,000, respectively (Jemal et al., 2009).

Despite these improvements, cervical cancer is still a major cause of morbidity and mortality in developing countries (Cronjé, 2004; Lewis, 2004; Jemal et al., 2011). As can be seen in Figure 1, there is a huge difference between developed and developing countries. This difference most probably reflects stark inequalities in health care systems, and represents a challenge for these countries (Cronjé, 2004).
The main reason for this excess in risk of disease and death in developing countries is the lack of effective screening programs. This is for an important part attributable to the lack of awareness of cervical cancer among the population, policy-makers and even health care providers; the limited access to health care services, either geographically or economically; the high costs of cytology-based screening; the lack of specific expertise in sampling and interpretation of specimens; and the necessity of repeated visits by women (Cronjé, 2004; Lewis, 2004; WHO Collaborative, 2006).

Although alternative screening methods have been developed and primary prevention may be possible through vaccination, early detection will remain necessary for years to come.

**Cervical dysplasia and Cervical cancer**

Cervical dysplasia or cervical intraepithelial neoplasia (CIN) is a term for a continuum of epithelial lesions of the cervix uteri ranked in three grades based on increasing degrees of cellular change and disorganization. They are considered precursor lesions for a potentially fatal disease, cervical cancer. Nearly all cases of cervical cancer arise from CIN lesions, but not all CIN lesions progress to cancer. Indeed, many persist without change or even regress. The development cancer from CIN can take decades, which is the precise reason why this type of cancer is
worth screening for. The long duration of probable progression is clearly depicted in the age
distribution of these lesions. Figure 2 shows the succession of malignant changes in the
cervical epithelium as a function of age. On the basis of histology, these lesions are graded as:
CIN 1 (mild dysplasia), CIN 2 (moderate dysplasia) and CIN 3 (severe dysplasia and
carcinoma in situ) (Montag & Kumar, 2007).

**Classification of cervical dysplasia**

As mentioned above, cervical dysplasia can be detected by cytological examination. Table 1
shows the various classification systems in use. The oldest is the Pap-classification, based on
morphological changes of a normal cell to a cell with severe dysplastic characteristics. The
CIN system was developed in 1968 and takes into account the natural history of the different
types of lesions. It is still employed in many countries to describe cytological changes,
although it

<table>
<thead>
<tr>
<th>Cytological classification</th>
<th>Histological classification</th>
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<tr>
<td>Pap</td>
<td>Bethesda system</td>
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<tr>
<td>Class I</td>
<td>Normal</td>
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<td>Class II</td>
<td>ASC-US**</td>
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<td>Class IIIa</td>
<td>LSIL</td>
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<td>Class IIIb</td>
<td>HSIL</td>
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<td>Class III</td>
<td>CIN 3</td>
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<tr>
<td>Class IV</td>
<td>Invasive carcinoma</td>
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<tr>
<td>Class V</td>
<td>Invasive carcinoma</td>
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</tbody>
</table>

*WHO = World Health Organization
**ASC-US: atypical squamous cells of undetermined significance
***ASC-H: atypical squamous cells, cannot rule out high-grade lesion
Source: WHO, 2006

should be used for histological reports. The WHO dysplasia scale is still the most commonly
used. The Bethesda system was devised in the USA in the 1990s and was revised in 2001. It
combines CIN 1 and flat condyloma into the category low-grade squamous intraepithelial lesion (LSIL) and brings CIN 2 and CIN 3 together to form the high-grade squamous intraepithelial lesion (HSIL) category. Even though the WHO has its own descriptive classification, it recommends the use of the 2001 Bethesda system (Lobi Foundation, 2001; WHO Collaborative, 2006; Montag & Kumar, 2007).

In the Netherlands, since 1996 the KOPAC-B classification system was developed and used in concordance with the Pap-classification (“Cervicale Intra-epitheliale Neoplasie (CIN). Landelijke richtlijn, Versie: 1.1,” 2004). This system is based on the interpretation of smears on quality, degree of inflammation, changes in squamous cells, changes in columnar cells, normal or changed endometrial cells and a description of any problem for a correct interpretation (Lobi Foundation, 2001).

**Anatomical insight**

The cervix uteri is the lower one-third of the uterus, composed of fibromuscular tissue, and covered by two different epithelia. The part of the cervix that lies in the vagina is visible with a speculum and called ectocervix. The upper part of the cervix is called the endocervix and lies above the vagina. The cervical canal runs through the center and is also visible by inspection as a small opening, named the external os. As mentioned above, the cervix is lined by squamous and columnar epithelium. The squamous epithelium is thick and multilayered, consists of flat cells and covers most of the ectocervix and the vagina. Columnar epithelium is a single and thin layer of columnar cells starting within the cervical canal and extending outwards to a variable portion of the ectocervix. In between, lays the
squamocolumnar junction (SCJ), a very distinct demarcation. With increasing age the columnar epithelium grows outwards, moving the SCJ further outward. Because of the acidic vaginal environment the cells are gradually replaced by squamous epithelium, which is called squamous metaplasia. This is a normal process and a newly formed SCJ is also very visible on inspection. This zone of cells between the original and the new SCJ is called the transformation zone. The cervix goes through changes from birth until after menopause. The transformation zone is larger during puberty and young adulthood, during pregnancy, and in women who use oral contraceptives. Most premalignant—and malignant lesions develop in the transformation zone (Lobi Foundation, 2001; Montag & Kumar, 2007)

**Natural history and risk factors**

The CIN classification suggests a morphological and biological continuum of progressive and consecutive stages in the development of cervical cancer. However, several studies on the natural history of cervical cancer showed that CIN 1 and CIN 2 are more likely to regress than to progress (Holowaty et al., 1999). Only 10-15% of CIN 1 lesions progress to CIN 2+ lesions. Fifty percent of the CIN 2 lesions and 30% of CIN 3 regress spontaneously (Kiviat, 1996; Melnikow et al., 1998; Holowaty et al., 1999). On the other hand, the higher the grade
of the precursor lesion, the greater the chance that it will progress to cancer. The development from CIN 1 to CIN 3, and subsequently to invasive cancer, can take several decades (Cronjé, 2004). Figure 5 depicts the above mentioned concept of the natural history of cervical cancer (Franco et al., 2001).

The human papillomavirus (HPV) is now recognized as the major causative agent for premalignant and malignant lesions of the cervix uteri. This virus is sexually transmitted and affects both men and women (Cronjé, 2004). There are more than 80 HPV sub-types, but only a small proportion (called high-risk types) is associated with the development of CIN lesions that ultimately progress to invasive cancer. While low-risk types are mainly found in genital warts, in 85-95% of cervical cancer cases DNA from high-risk HPV is detected (Cronjé, 2004).

The International Agency for Research on Cancer (IARC) concluded in 1995 that there was sufficient evidence to classify HPV types 16 and 18 as high-risk or oncogenic. Since then more studies in several countries have been conducted and the pooled data identified 15 HPV types as high-risk. These are types 16, 18, 31, 33, 35, 39, 45, 51, 52, 58, 59, 68, 73, and 82 (Muñoz et al., 2003). In most countries, HPV types 16 and 18 are responsible for 46-63% and 10-14% respectively, of cervical cancer cases (Bosch et al., 1995). Less common high-risk types (types 45, 31 and, 33) show a significant geographical variation in prevalence (Bosch et al., 1995; Clifford et al., 2003). These variable type-specific prevalence rates could mean lesser efficacy of potential HPV vaccines (Clifford et al., 2003).

An inverse relationship between age and HPV infection exists in many developed countries. Risk for HPV infection is 10-fold higher in women younger than 25 years than women older than 45 years (Franceschi et al., 2006). But in developing countries a second peak occurs at the age of 55 and older. It seems that the age distribution of HPV infections may vary from one population to another. HPV prevalence is consistently the highest among the youngest women, but at older age the differences are more visible (Franceschi et al., 2006). Furthermore, certain HPV subtypes may have a predilection for certain histological subtypes of cervical cancer. Thus, squamous cancer might be associated with HPV type 16 and
adenocarcinoma more likely with type 18 (Bosch et al., 1995; Clifford et al., 2003). Explanations are still speculative and more research needs to be done in light of vaccine development and its efficacy.

The progression of HPV infection to dysplasia and/or cancer is probably influenced by a number of environmental co-factors. These include, among others, high parity, long-term use of oral contraceptives, sexual behavior, tobacco smoking and other sexually transmitted infections. The evidence for a role of nutritional factors in this process is limited (Castellsagué & Muñoz, 2003).

High parity (seven or more full term pregnancies) increases the risk for cervical cancer 4-fold when compared to nulliparous women (Muñoz et al., 2002; Castellsagué & Muñoz, 2003).

The use of oral contraceptives for five years and longer increases the risk to develop cervical cancer 3-fold, while their use for longer than 10 years increases the risk 4-fold when compared to non-users (Moreno et al., 2002; Castellsagué & Muñoz, 2003).

Sexual behavior involving more than two life-time sex partners and earlier age at first intercourse, increases the risk for HPV infection and developing cancer (International Collaboration of Epidemiological Studies of Cervical Cancer, 2009).

Smoking of cigarettes is the most consistent finding in risk factor studies. This practice is associated with a 2-fold increased risk for high-grade CIN lesions and invasive cancer, which increases with the number of cigarettes per day and the number of years a woman smokes (Castellsagué & Muñoz, 2003; McIntyre-Seltman et al., 2005).

Sexually transmitted diseases seem to enhance the susceptibility of the cervix epithelium for HPV infection. Infections with Chlamydia trachomatis increases the risk almost twice for developing cervical cancer (Smith et al., 2004; Lehtinen et al., 2011).
Immunosuppression has recently been recognized as a risk factor for HPV infection. There is consistent evidence that HIV-positive women have a higher prevalence of HPV infections and more persistent infections, which probably enhance their risk for cervical dysplasia. The risk increases 10-fold for CIN 2/3 and 7-fold for invasive cancer. As yet, the precise role of HIV in this process is not clear (Atashili, 2009; Holmes et al., 2009).

**Epidemiology**

*Global patterns of cervical cancer*

Worldwide, cervical cancer is the third most common cancer in women and the seventh most common cancer overall (Ferlay et al., 2010; Jemal et al., 2010). According to the International Agency for Research on Cancer (IARC), there were 530,000 new cases and 275,000 deaths in the year 2008 (Ferlay et al., 2010). The lowest rates (less than 6 per 100,000 population) are found in Western Asia, Northern America, as well as Australia and New Zealand (Ferlay et al., 2010). These low rates are the results of very comprehensive and effective cytology-based screening programs, implemented in the 1960s and 1970s (Ferlay et al., 2010). On the other hand, 85% of cervical cancer cases and 80% of deaths due to this malignancy occurred in developing countries. In these regions, cervical cancer accounts for at least 13% of all cancers in women (Lewis, 2004; Ferlay et al., 2010). Examples of such high-risk regions are Eastern and Western Africa, where incidence rates are typically 23 to 30 cases per 100,000 population (Ferlay et al., 2010; Jemal et al., 2011).

![Figure 6. Comparison of worldwide occurrence of cervical cancer. Source: Jemal et al., 2011](image-url)
Such high rates are probably for an important part attributable to the lack of effective screening programs, with a screening coverage that is often 50% or less (Cronjé, 2004). Not surprisingly, cervical cancer incidence is anticipated to have increased by more than 75% in particularly developing countries by the year 2025 (Jemal et al., 2011).

*Patterns of cervical cancer in Latin American and the Caribbean*

Together, the developing countries carry more than 80% of the global burden of cervical cancer (Ferlay et al., 2010). Apparently, prevention, screening, and early detection efforts have had limited or no success in these areas. Latin American and the Caribbean are among the regions with the highest cervical cancer incidence and mortality rates in the world (Lewis, 2004; WHO Collaborative, 2006). Most of these countries either do not have cancer registries or have registries with limited coverage. Nevertheless, it could be estimated that there were 72,000 new cases of cervical cancer and 33,000 deaths due to this disease in 2002 (Lewis, 2004). This corresponded with an average cervical cancer mortality of more than 20 per 100,000 and a proportional mortality due to this malignancy of 6 to 49% of the total number of cancer deaths (Ferlay et al., 2010).

Furthermore, the cervical cancer incidence-to-mortality ratio for most Latin American and Caribbean countries is 2:3 (Lewis, 2004). This poor survival rate is probably for an important part attributable to late-stage presentation and, as mentioned above, ineffective screening practices (Lewis, 2004).

*Epidemiology of cervical dysplasia*

According to the World Health Organization (2006) the prevalence of premalignant cervical lesions varies considerably among populations. This figure depends on the frequency of disease, the age group that is evaluated, the previous screening status of the women undergoing testing, and the HIV prevalence in the population. As mentioned before, the number of lesions increases with high HIV prevalence (WHO Collaborative, 2006). Thus, in an unscreened population estimations for CIN 1 prevalence range from 3-10%, and those for CIN2 and CIN 3 (including CIS) from 1-5% (International Collaboration of Epidemiological Studies of Cervical Cancer, 2009)(WHO Collaborative, 2006).
In Brazil, for instance, a high-risk area for cervical cancer, a combined prevalence of 774 per 100,000 was found for dysplasia and cancer in the screened population. Prevalence for CIN 1 was 2.5 fold greater than CIN 3 (D’Ottaviano-Morelli et al., 2004). In China and Zaria, the combined prevalence in screened women was much higher, viz. 4400 and 4800, respectively, per 100,000 (Adekunle & Samaila, 2010; Wu, Liu, Zhou, Wulan, & Li, 2010). Notably, both countries are listed as the high-risk countries for cervical cancer. According to the Population Reference Bureau, an estimated 1.4 million women live with cervical cancer, implying that at least 2-5x more women harbor premalignant lesions that need to be identified and treated (Population Reference Bureau & Alliance for Cervical Cancer Prevention, 2004).

**Screening for Cervical cancer**

Cytology-based screening for cervical cancer is founded on the early detection of precursor lesions (CIN) in women. It has been a highly effective method of secondary prevention in industrialized countries. However, in most developing countries results with similar screening programs were disappointing. The main reasons are low coverage of the target population, limited access to health services, questionable quality of the screening procedure and, poor
follow-up for treatment. As a consequence, the programs had little or no impact on incidence or mortality of cervical cancer (Lobi Foundation, 2001; Lewis, 2004).

The Pap-smear technique has a low sensitivity (±50%) under ideal circumstances; in developing countries this could drop to 30% due to quality issues with sampling and interpretation. Specificity is 94% (Cronjé, 2004). Other disadvantages with cytology-based screening are the need for repeat smears and the recall of patients (Cronjé, 2004).

According to the WHO, a good screening program should achieve primary prevention, early detection, timely and accurate diagnosis and treatment and palliative care (WHO Collaborative, 2006). Recommendations for screening in resource-limited countries are age-targeted screening with cytology. Furthermore, the ideal age for screening is 25-65, which can be narrowed to 30-39 years depending on the resources available (WHO Collaborative, 2006). Annual screening is not recommended, before the age of 25 screening is not imperative, and after the age of 65 years screening can be stopped, provided previous smears are negative (Population Reference Bureau & Alliance for Cervical Cancer Prevention, 2004; WHO Collaborative, 2006).

The Alliance for Cervical Cancer Prevention (ACCP) released similar guidelines in 2007, but with the use of alternative methods such as HPV DNA-testing or visual inspection (VIA); cryotherapy is the recommended treatment for CIN (Alliance for Cervical Cancer Prevention, 2007).

Most important for any screening program to succeed is the coverage of the target population; a coverage of at least 70-80% will result in a significant reduction of cervical cancer incidence (Cronjé, 2004).
Current situation in Suriname

Previous studies on cervical dysplasia and cervical cancer

Few studies have been conducted in Suriname on the incidence or prevalence of cervical dysplasia. In 1987, a retrospective study described the occurrence of cervical lesions between 1979 and 1986 (Vrede & Sabajo, 1987). In this period, approximately 30,000 smears were examined and the data showed an overall distribution of cervical dysplasia for CIN 1-2, CIN 2-3, CIS, and invasive cancer of 3.6%, 0.8%, 0.4% and 0.1%, respectively (Vrede & Sabajo, 1987). Ethnic- and age distribution were not studied. For cervical cancer the average annual incidence rate for 1979-1986 was 20 per 100,000 women. More than 40% of women suffering from cervical cancer was Creole, 27.5% was Hindustani (Vrede & Sabajo, 1987). The number of cases was highest (33.7%) in women aged between 41 and 50 years (Vrede & Sabajo, 1987).

In 2006, a small study conducted within the National Cervical Screening Project reported on the prevalence of smear abnormalities in four ethnic groups (Vermeulen et al., 2006). The frequency of CIN 1, and CIN 2 combined with CIN 3/CIS was 2.6% and 2.6%, respectively. Most abnormalities were found in Maroon women (42.1%) (Vermeulen et al., 2006).

The first comprehensive data series about the occurrence and the distribution of cervical dysplasia in Suriname was published by Grunberg in 2008. These data were from the National Cervical Screening Project conducted between 1998 and 2001, when 38,000 women (mean age 33.9, highest attendance in the 40-44 age group) were screened and 504 precursor lesions (1.3%) were found (Grunberg, 2008). These lesions were arranged by age group and ethnic background according to the CIN classification. Seventeen and a half percent of the lesions graded as CIN 2 or CIN 3 were found in women aged 30 to 40 years, with the highest prevalence in women of Creole/Mixed and Maroon background. Surprisingly, there were less premalignant lesions when compared to overt cervical cancer (Grunberg, 2008).
Earlier studies conducted on cervical cancer in Suriname had already provided indications on differences in age- and ethnic distributions. Evaluating pathology records and hospital data on invasive cervical cancer over the period 1989-1994, Krul et al. (1996) concluded that young patients tended to present with early-stage disease, but that the majority of patients presented with late-stage disease. Furthermore, the disease seemed to be more prevalent in Amerindian and Javanese women (Krul et al., 1996).

In another study conducted by Mans et al. in 2003, Suriname was found to be among the low-cancer incidence countries in the world, except for cervical cancer. Cervical cancer was found to be the leading malignancy between 1980 and 2000, overall and of all cancers in women (Mans et al., 2003). It accounted for 27% of all female cancers and for 80% of all uterine cancers (Mans et al., 2003). The sex-specific rate was 22.1 per 100,000 (Mans et al., 2003). In general cancer was 2-6 times more common in Creoles than in Hindustanis and Javanese, but cervical cancer incidence in Creoles and Hindustanis did not differ statistically significant from each other (Mans et al., 2003). There was also no difference in incidence between the 20-49 year age group and the group older than 50 years. These findings were validated in two other publications by Mans et al. (2008, 2011). Notably, the ethnic and age distribution of cervical cancer was essentially the same in urban and rural populations (Mans et al., 2008).

**Screening practices**

Screening programs for cervical cancer have been available in Suriname for more than 30 years. The Lobi Foundation started offering this service in 1979 through cytology-based examinations (Pap Smears) (Lobi Foundation, 2001). Nowadays, this institution is still the referral center for cervical cancer screening and covers 75-85% of all the evaluations nationwide. The remaining 15-25% is covered by the gynecologists, affiliated to the various hospitals. From 1998 to 2001 the National Cervical Screening Project was implemented in collaboration with the Ministry of Health (Grunberg, 2008). As follow up of this project several studies were conducted that led to the introduction of another screening method. In 2007 Visual Inspection with Acetic acid (VIA) was introduced besides cytology. Since then, the number of Pap smears has decreased, and is reserved for older women and special cases. Still, not much is known about the overall occurrence and distribution of risk factors of
cervical dysplasia. Previous studies provided some meaningful insights (Vermeulen et al., 2006; Grunberg 2008), but the overall picture is still not clear. Data on cervical cancer mortality over the last decade suggest that the number of deaths has remained more or less constant (Punwasi, 2009). Using this information, this study will focus on the occurrence and the age and ethnic distribution of cervical dysplasia and cervical cancer, with additional attention to cervical cancer mortality.

**Aims**

This thesis focuses on the occurrence of cervical dysplasia and cervical cancer, and the age and ethnic distribution of these lesions in Suriname. The results from this study may provide estimates of the potential burden of cervical cancer in Suriname, and indications about associated risk factors as well as the target population to concentrate on during screening. These data may also provide indications about the success rate of past and current screening practices, and present some tools for improvement of early detection and prevention of cervical cancer. This information may be useful for the execution of both primary and secondary prevention programs through the administration of HPV vaccines and the implementation of more comprehensive screening programs.

**Research questions**

What are the occurrence, and the age and ethnic distribution of cervical dysplasia in the period 1995-2006?

What are the incidence, and the age and ethnic distribution of cervical cancer in the period 1980-2008?

What are the mortality due to, and the age and ethnic distribution of cervical cancer in the period 1995-2010?

What are the relationships among these variables?
Methods

Study design and study population

This was a retrospective study to relate data on the age and ethnic distribution of cervical dysplasia to those of cervix carcinoma incidence and cervical cancer mortality in Suriname. The study design was descriptive and exploratory in nature. Information about the premalignant lesions was available for the period 1995 to 2006, for the malignant neoplasms for 1980 to 2008, and for cervical cancer mortality for 1995 to 2010.

Sources of data

The data on cervical dysplasia were collected at the Lobi Foundation from the Pap Smear forms and on the basis of the CIN classification. The smears were evaluated by a cytologist and all positive results were confirmed by a pathologist. The Lobi Foundation is a non-governmental organization for reproductive health services and the primary and the referral institute for cervical cancer screening in Suriname. It covers at least 75% of the cervical screening in Suriname in conjunction with several public and private primary health care institutions and a number of physicians.

The data on cervical cancer were retrieved from the Pathologic Laboratory from the Academic Hospital Paramaribo, the only pathology center in Suriname. This institution is involved in the evaluation of cytology smears and the histopathological confirmation of patient specimens from all hospitals in the country.

Data on cervical cancer mortality were based on death certificates from the Department of Epidemiology and Biostatistics from the Bureau of Public Health (BOG) of the Ministry of Health. For the years 1995 to 1999, only the number of deaths was available.
Population statistics were received from the General Bureau of Statistics (ABS) of the Ministry of Finance of Suriname. Data on the size of the female populations of Suriname stratified according to age were available for 1980 (5th Census), 2004 (7th Census), and 2000 to 2010 (Algemeen Bureau voor de Statistiek, 2009; Algemeen Bureau voor de Statistiek, 2011). Data on the size of the different ethnic groups were only available for the census year 2004. For the period between 1980 and 2000, only non-stratified total mid-year populations were available.

In the CIN dataset, information on ethnic background was missing in 20% of the records. Suriname is a multi-ethnic community and the most recent population data on ethnic distribution are only available from the 7th Census executed in 2004 and were based on self-identification. Extrapolations of estimates of the different ethnic populations in years thereafter have not been done. Older estimates can be derived from the 3rd Census from 1972. In the 5th Census from 1980, data collection on ethnicity was not allowed. Estimates were based on surname, religion, and spoken language.

**Data collection**

The data on cervical dysplasia consisted of 2,554 records over the period 1995-2006, and included identification code, place of residence, date of birth, ethnic background, date of screening, and the outcome of the smear. When a woman had undergone repeated tests during one year, only the “worst” outcome was noted. There was also information available about total number of smears per year. The data on cervical cancer occurrence and mortality were digitally available. Those databases consisted of 1,494 records for cervical cancer and 358 for mortality due to cervical cancer.

The collected data were entered using an electronic database in MS Access. The risk of violation of confidentiality has been minimized by storing the database in a separate location. It was furthermore agreed to hand the database to the Lobi Foundation after analysis.
Data analysis

Cervical dysplasia

The proportion of each cytological diagnosis of CIN in the screened population was calculated according to year of diagnosis, by dividing the total number of cases divided by the total number of smears. The distribution of these different categories within the total number positive smears was also calculated. The data on total smears per year were used to calculate estimates for the national coverage of the Lobi Foundation screening program. The total number of positive smears per year was divided by the estimated target population of females 18 years and older. The age distribution of CIN is represented as the proportion of the total number of positive cases per 10-year age group. For the ethnic distribution the proportion of the different histological grades was calculated within the groups.

Cervical cancer

The average annual incidence rates for cervical cancer were calculated for the period 1980-2008 by dividing the number of cervical cancer cases by the estimated total number of females for that year and were expressed per 100,000 populations.

The age distribution of cervical cancer was presented as the number of cases and percentages of the total number of cervical cancer per 10-year age group. The proportions were compared by calculating the ratios with the 20-29 age group as reference (ratio of 1).

The ethnic distribution of cervical cancer was presented as crude ethnic-specific incidence rates for the whole period covered. The calculations were based on the total number of cases divided by the estimated total number of women for that ethnic group. For comparison of the specific incidence rates the relative risk (rate ratios) were calculated and the group with the lowest incidence was used as reference.
Mortality due to cervical cancer

Annual mortality rates for cervical cancer are calculated by dividing the number of deaths by the estimated total female population per year. The age distribution for cervical cancer deaths was represented by the proportions of deaths per 10-year age group for the whole time period. The ethnic distribution was represented by the calculated specific mortality rates for the different ethnic groups. For comparison rate ratios were calculated and the average mortality rate for the time period covered was used as a reference. Where possible, time trends of cervical cancer incidence and mortality rates are presented.

Statistics

All rate ratios were calculated within 95% confidence intervals. For evaluating statistical significance, the Chi-square test, Student’s t-test, and/or ANOVA was/were used. P values < 0.05 were taken to indicate statistical significance.
Results

Cervical dysplasia

Occurrence

Between 1995 and 2006, a total of 144,846 women have been screened for cervical dysplasia. Of these, 2,518 (1.7%, or on average 1-3% per year) were found to be positive (Table 2). A positive screening result is defined as CIN 1 or higher. The number of positive cases decreased with increasing histology grade: CIN 1 was seen in more than half of the cases, CIN 2 in almost one-third of cases and CIN 3 including CIS in less than one-fifth of cases (Table 2). Thus, these lesions occurred in approximately 1, 0.5, and 0.2%, respectively, within the evaluated population.

Table 2. Number of cervical dysplasia (percentage in brackets) and mean age per CIN diagnosis, 1995-2006

<table>
<thead>
<tr>
<th>Histological Diagnosis</th>
<th>Number of positive cases (%)</th>
<th>Mean age ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIN 1</td>
<td>1362 (54.1)</td>
<td>37.63 ± 10.38</td>
</tr>
<tr>
<td>CIN 2</td>
<td>706 (28.0)</td>
<td>38.36 ± 10.50</td>
</tr>
<tr>
<td>CIN 3/CIS</td>
<td>450 (17.9)</td>
<td>42.94 ± 11.21*</td>
</tr>
<tr>
<td>Total</td>
<td>2518 (100.0)</td>
<td>38.80 ± 10.77</td>
</tr>
</tbody>
</table>

*Statistical significant difference, p-value<0.001, 95% Confidence Interval; SD = standard deviation

To place the above results in better context the national coverage for screening was estimated. The average number of smears per year was 11,510 ± 4,162. The national coverage ranged from 1 to 13% between 1990 and 2010 with an overall average of 7 ± 2%. The highest coverage was seen in 1999 and 2000.
**Age distribution**

The mean age overall was about 39 years. The same held true for CIN 1 and CIN 2 (Table 2). On the other hand, CIN 3 lesions and CIS were detected at a significantly older age, namely at about 43 years (Table 2).

Table 3 shows the age distribution of the different grades of cervical dysplasia. Between 64 and 71% of CIN 1, CIN 2 and CIN 3/CIS lesions were encountered in women aged between 30 and 49 years. This indicates that approximately 2 out of every 3 cervical dysplasia occurred in this age group.

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Number of CIN 1 (%)</th>
<th>Number of CIN 2 (%)</th>
<th>Number of CIN 3/CIS (%)</th>
<th>Number of all CIN (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-9</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>10-19</td>
<td>16 (1)</td>
<td>3 (0)</td>
<td>1 (0)</td>
<td>20 (1)</td>
</tr>
<tr>
<td>20-29</td>
<td>283 (21)</td>
<td>139 (20)</td>
<td>31 (7)</td>
<td>453 (18)</td>
</tr>
<tr>
<td>30-39</td>
<td>560 (41)</td>
<td>289 (41)</td>
<td>165 (37)</td>
<td>1014 (40)</td>
</tr>
<tr>
<td>40-49</td>
<td>318 (23)</td>
<td>171 (24)</td>
<td>154 (34)</td>
<td>643 (26)</td>
</tr>
<tr>
<td>50-59</td>
<td>130 (10)</td>
<td>70 (10)</td>
<td>53 (12)</td>
<td>253 (10)</td>
</tr>
<tr>
<td>60-69</td>
<td>50 (4)</td>
<td>26 (4)</td>
<td>31 (7)</td>
<td>107 (4)</td>
</tr>
<tr>
<td>70-79</td>
<td>5 (0)</td>
<td>7 (1)</td>
<td>14 (3)</td>
<td>26 (1)</td>
</tr>
<tr>
<td>80+</td>
<td>0 (0)</td>
<td>1 (0)</td>
<td>1 (0)</td>
<td>2 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>1362 (100)</td>
<td>706 (100)</td>
<td>450 (100)</td>
<td>2518 (100)</td>
</tr>
</tbody>
</table>

**Ethnic distribution**

From the CIN database a number of 2005 records (CIN 1 1083, CIN 2 554, and CIN 3/CIS 368) were retrieved with information on ethnicity. Due to low numbers of cases in some groups, only 5 ethnic groups (Hindustani, Creoles, Javanese, Maroon and Indigenous) were further analyzed.

As shown in Table 4, similarly to the overall data presented in Table 2, in all ethnic groups, the number of positive cases decreased with increasing histology grade. Nonetheless, CIN 1 lesions seemed to be more common in Creole and Hindustani women, while CIN 3 lesions
and CIS might be more prevalent in Indigenous women compared to Creole women. However, these differences were not statistically significant.

### Table 4. Cervical dysplasia distribution within different ethnic groups, 1995-2006 (percentage of total number in brackets)

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of CIN 1 (%)</th>
<th>Number of CIN 2 (%)</th>
<th>Number of CIN 3/CIS (%)</th>
<th>Number of all CIN (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindustanis</td>
<td>351 (58)</td>
<td>151 (25)</td>
<td>108 (18)</td>
<td>610 (100)</td>
</tr>
<tr>
<td>Creoles</td>
<td>360 (57)</td>
<td>171 (27)</td>
<td>104 (17)</td>
<td>635 (100)</td>
</tr>
<tr>
<td>Javanese</td>
<td>162 (50)</td>
<td>97 (30)</td>
<td>63 (20)</td>
<td>322 (100)</td>
</tr>
<tr>
<td>Maroons</td>
<td>161 (49)</td>
<td>34 (31)</td>
<td>65 (20)</td>
<td>327 (100)</td>
</tr>
<tr>
<td>Indigenous</td>
<td>49 (44)</td>
<td>34 (31)</td>
<td>28 (25)</td>
<td>111 (100)</td>
</tr>
</tbody>
</table>

### Incidence of Cervical Cancer

#### Incidence rates and time trend

Between 1980 and 2008, there were 1,494 cases of cervical cancer, corresponding to approximately 52 cases per year. The average rate for this period was 24 ± 4.8 per 100,000 females. Figure 8 shows the time course of cervical cancer incidence over the period 1980 to 2008. Although there was much fluctuation, this pattern suggests that the yearly number of
new cases has decreased by roughly 40%, i.e., from around 30 per year to approximately 18 per 100,000 women per year.

**Age distribution**

Data on age was available for 1118 records. The median age of women diagnosed with cervical cancer during the years 1980-2000 was 51 (range 22-100). There were no cases in women younger than 20 years. Table 5 shows that approximately two-thirds of cervical cancer cases occurred in the 30-59 year age group (62.4%). Almost one-third was in the 60-79 year age group. Notably, 6% of cases (i.e., about 1 out of 20) was 80 years or older (Table 5) and at least 40% of this group was 90 years or older at the time of diagnosis (data not shown).

**Table 5. Age distribution for Cervical Cancer, 1980-2000  (percentage of total number between brackets)**

<table>
<thead>
<tr>
<th>Age Group (years)</th>
<th>Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>0 (0)</td>
</tr>
<tr>
<td>20-29</td>
<td>33 (3)</td>
</tr>
<tr>
<td>30-39</td>
<td>204 (18)</td>
</tr>
<tr>
<td>40-49</td>
<td>278 (25)</td>
</tr>
<tr>
<td>50-59</td>
<td>218 (19)</td>
</tr>
<tr>
<td>60-69</td>
<td>179 (16)</td>
</tr>
<tr>
<td>70-79</td>
<td>135 (12)</td>
</tr>
<tr>
<td>80+</td>
<td>71 (6)</td>
</tr>
<tr>
<td>Total</td>
<td>1118 (100)</td>
</tr>
</tbody>
</table>
**Ethnic distribution**

Information about ethnic background for the period covered by this study was available for 988 records. Table 6 shows that the cervical cancer incidence was highest in Indigenous and Creole women namely, 38 per 100,000. These values were almost 60% higher than the national average (Table 6). The lowest incidence rate (8 per 100,000) was in Maroon women (Table 6). This value was three times lower than the national average (Table 6) and almost five times lower than the rates in Indigenous and Creole women. Cervical cancer incidence rates in Hindustani and Javanese women were in the range of the national average, but still significantly higher than those found for maroon women (Table 6).

**Table 6. Ethnic-specific crude Incidence Rates per 100,000 for Cervical Cancer, 1980-2000 (percentage of total number in brackets)**

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Number of Cases (%)</th>
<th>Population size*</th>
<th>Incidence Rate</th>
<th>Rate Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>National average</td>
<td>24</td>
<td>1.0</td>
<td>24</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Maroon</td>
<td>66 (7)</td>
<td>812,280</td>
<td>8</td>
<td>0.33</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Hindustani</td>
<td>294 (30)</td>
<td>1,387,764</td>
<td>21</td>
<td>0.88</td>
<td>0.0542</td>
</tr>
<tr>
<td>Javanese</td>
<td>214 (22)</td>
<td>736,008</td>
<td>29</td>
<td>1.21</td>
<td>0.0079</td>
</tr>
<tr>
<td>Creoles</td>
<td>343 (35)</td>
<td>907,410</td>
<td>38</td>
<td>1.58</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Indigenous</td>
<td>71 (7)</td>
<td>188,748</td>
<td>38</td>
<td>1.57</td>
<td>0.0002</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>988 (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Population = Estimated Female Population size all ages, 1980-2000

**Mortality due to cervical cancer**

**Mortality rate and time trend**

Between 1995 and 2010 358 women died from cervical cancer in Suriname. This corresponds with 22 ± 7 fatalities per year, or an annual mortality rate of 10 ± 3 per 100,000 population.
Figure 9 shows the time course of cervical cancer mortality between 1995 and 2010. Despite much fluctuation, there seems to be an almost 40% increase over this period, from approximately 7 to 11 per 100,000 (Figure 9).

**Age distribution**

Data on age was available for 283 records. As shown in Table 7, 37% of cervical cancer deaths were younger than 50 years, and 25% of these women were in the age group 40-49 years. This implies that roughly one out of every three deadly victims of this disease had not reached the age of 50 years and that one out of every four of these women was between 40 and 49 years of age. The remaining two-thirds of cervical cancer fatalities were 50 years and older (Table 7). Roughly half of this group was 50-69 years of age; the other was 70 years and older.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Number of Deaths (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>0 (0)</td>
</tr>
<tr>
<td>20-29</td>
<td>6 (2)</td>
</tr>
<tr>
<td>30-39</td>
<td>29 (10)</td>
</tr>
<tr>
<td>40-49</td>
<td>70 (25)</td>
</tr>
<tr>
<td>50-59</td>
<td>42 (15)</td>
</tr>
<tr>
<td>60-69</td>
<td>58 (21)</td>
</tr>
<tr>
<td>70-79</td>
<td>53 (19)</td>
</tr>
<tr>
<td>80+</td>
<td>25 (9)</td>
</tr>
<tr>
<td>Total</td>
<td>283 (100)</td>
</tr>
</tbody>
</table>
older (Table 7). The median age for women who died from cervical cancer was 59 years (range 25-101).

**Ethnic distribution**

Table 8. Number of deaths and mortality rates per 100,000 among ethnic groups, 2000-2010

<table>
<thead>
<tr>
<th>National Average (reference)</th>
<th>Number of Deaths (%)</th>
<th>Population size*</th>
<th>Mortality Rate</th>
<th>Rate Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creoles</td>
<td>69 (27)</td>
<td>475,310</td>
<td>15</td>
<td>1.39</td>
<td>0.013</td>
</tr>
<tr>
<td>Hindustani</td>
<td>68 (26)</td>
<td>726,924</td>
<td>9</td>
<td>0.90</td>
<td>0.42</td>
</tr>
<tr>
<td>Javanese</td>
<td>64 (25)</td>
<td>385,528</td>
<td>17</td>
<td>1.59</td>
<td>0.007</td>
</tr>
<tr>
<td>Indigenous</td>
<td>24 (09)</td>
<td>98,868</td>
<td>24</td>
<td>2.33</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Maroon</td>
<td>35 (13)</td>
<td>425,480</td>
<td>8</td>
<td>0.79</td>
<td>0.18</td>
</tr>
</tbody>
</table>

*Based on estimated female population size, all ages, 2000-2010

Table 8 shows that the mortality due to cervical cancer was highest in Indigenous and Javanese women, viz. 24 and 17, respectively, per 100,000 women. This was approximately twice as high as the average national mortality rate (Table 8). The mortality rate in Creole women was slightly, but still significantly higher than the national average (Table 8). Hindustani and Maroon women had the lowest cervical cancer mortality; the rates of 9 and 8, respectively, per 100,000 population were close to the national average (Table 8).
Discussion

Screening coverage Lobi Foundation

Current health policy recommends screening for women aged 18 years and older (Lobi Foundation, 2001). The age of the women identified with a positive smear for cervical dysplasia ranged from 15 to 82. No information was available for the women with negative smears. The target population used to calculate coverage was the female population aged 15 years and older. This resulted in an underestimation of the coverage estimate. Figure 10 displays the calculated screening coverage of the Lobi Foundation from 1990 to 2010. The screening coverage is very low and during the time period covered it seems that the coverage on average even declined. There was a sharp increase in 1999 and 2000 which can be attributed to the awareness campaign that accompanied the National Cervical Screening Project previously mentioned (Grunberg, 2008). There is no sensible explanation for the sharp decline afterwards (2002 and 2003). An error on the part of the statistical department of the Lobi Foundation could not be verified. For a screening program to be effective a coverage of at least 80% must be achieved for any significant impact on both incidence and mortality of cervical cancer (Cronjé, 2004; WHO Collaborative, 2006).

Occurrence of cervical dysplasia (CIN) and cervical cancer

According to the WHO the number of premalignant lesions is related to the frequency of the disease itself, the age of the women that are screened, their previous screening status and the prevalence of HIV (WHO Collaborative, 2006). In an unscreened population aged 25-65
years the occurrence of low-grade lesions (CIN 1) is 3-10% and high-grade lesions (CIN 2, CIN 3 and CIS) 1-5% (WHO Collaborative, 2006). The estimated average occurrence for all cervical dysplasia in the screened population in this study is 1.7%. As outlined below, this is probably an underestimation of the true value in the population.

Although the obtained information might be considered of limited quality because of the secondary nature, it is the most complete information obtainable on the profile of cervical dysplasia. The results obtained from this study although, cannot be inferred to the whole female population. They represent only the demographics of women that were screened and diagnosed with cervical dysplasia. Information was not available for the screened women with negative smears. The low screening coverage makes this sample not a true representation of the whole target population. Though they give a good indication on at least the population of screened women with abnormal smears, we should be careful considering the result applicable to the unscreened population. They might differ in demographics and occurrence of risk factors due to selection bias. There were several shortcomings identified during the executed project regarding the quality of the smears and the interpretation by cytologists. Concern was uttered about the great number of false negative smears (Grunberg, 2008). This would decrease the proportion of abnormal smears found and therewith lowered the estimated incidence. Besides these quality issues, it has been shown that the sensitivity of the Pap smear method is about 50%, leading to more false negative results (Cronjé, 2004). These factors add up to underestimation of the true occurrence of cervical dysplasia in the female population.

The overall average incidence for cervical cancer was 24 per 100,000 for the years 1980 to 2008. Compared to estimated incidence rates in Latin America and the Caribbean calculated by the WHO/PAHO for that same period, Suriname falls in the category of countries with some of the highest cervical cancer incidence rates in the region (Lewis, 2004). The average incidence for Latin America for the year 2000 is 31 per 100,000. Comparing with international data should be done carefully, for these data are a mixture of real data, extrapolations of limited samples and informed guesses which could lead to overestimation (Parkin et al., 2002; Ferlay et al., 2010). The population statistics used could also quite differ. Still, the results classify Suriname as a high-risk country for cervical cancer, which was also concluded in previous studies (Krul et al., 1996; Mans et al., 2003).

The trend observed in the studied time period shows an almost 40% decrease in incidence until 2000. The downward trend can be explained partly by population growth and a
fluctuating but stable total number of cases. Other reasons could be the detection of more cases with better diagnostic techniques or improved survival of cancer patients due to better treatment options. Any impact of screening in the time period before can be discarded for the reasons mention before. Further research on cervical cancer could possibly support this.

Age distribution

The age distribution of cervical dysplasia follows international patterns. The mean age of 39 years for the low-grade lesions, and the significant older women for the high-grade lesions (mean age 43) and cervical cancer (mean age 53) are in parallel with distributions in other countries with the same incidence (Muñoz et al., 2008).

The data suggest that most women screened with abnormal smears are about the same age, with a tendency for high-grade lesions to occur in somewhat older women. The women with the highest risk are those aged 30 to 49 years.

Women with cervical cancer are significantly older than those with dysplasia. The bulk of the cancerous lesions occur in the 40-49 group. Older women, aged between 60 and 79 are also at risk for the development of cervical cancer, one-third of the cases occur within this age group. Most cases of death occur in the 40-79 age group, with almost half in the 60-79 age group. These results could mean that screening practices do not reach enough women to prevent disease and many cases and death due to cervical cancer occur in older women.

Information on Ethnicity

The 4 main ethnic groups in Suriname are the Hindustani (27.02%), Creoles (17.66%), Maroon (15.81%) and Javanese (14.33%) (Algemeen Bureau voor de Statistiek, 2005). Although the Indigenous people are a mere 3.67% of the total population, they are included in the analysis based on previous studies indicating their possible high-risk profile (Krul et al., 1996; Mans et al., 2003). The Mixed ethnicity group was not analyzed even though they represent 12% of the total population. The designation “mixed” entails combinations of all other ethnic groups, which would make any interpretation of results with regards to ethnicity very difficult. Within the Lobi Foundation, information on ethnicity is based on self-
identification and guess work. Results should therefore be interpreted with caution, because of possible misclassification.

Ethnic distribution

In this study no differences were found for the distribution of CIN among and within ethnic groups, although previous studies have found possible excess risk for low-grade lesions in Maroon women. But for cervical cancer and mortality due to cervical cancer high-risk groups were identified. High-risk groups for cervical cancer are the Indigenous and Creole women. Risk of death from cervical cancer is high in the Indigenous women, followed by the Javanese and Creole women. For both cervical cancer and mortality due to cervical cancer the Maroon women have the lowest risk for the time period studied.

The data also show that Maroon women, even though they have the lowest risk for developing cancer, are significantly older than the women of the other ethnic groups, except the Creoles.

The Creole women

The high incidence of cervical cancer in creole women is not without precedence and was expected. Earlier studies on the incidence of cancer in Suriname have shown a predilection of this ethnic subpopulation for several types of cancer, including cervical cancer (Mans, 2003). Leckie showed in his study that Creole women displayed the well-established risk factors for cervical cancer like high parity, early age at first sex and early pregnancies, more than other subgroups. Together with the Maroon women use of contraceptives is very little (Leckie, 2010).

The Maroon women

The Maroon women show a discrepancy in incidence rates. Previous studies have shown high rates for dysplasia, which was not confirmed in this study (Vermeulen et al., 2006). However, it was found that they have a significant lower risk of developing and dying of cervical cancer. During the National Cervical Screening Project Leckie (2010) explored possible high risk behavior for developing cervical cancer. Maroon women used less oral contraceptives, had first sexual intercourse at an earlier age (mean 16 years), tended to have children at an earlier age (first child at 16 years) compared to other ethnic groups. It was also shown that Maroon women screened less than others, which could have been related to their low educational level and the poor access to health preventive services in the interior. These
woman also have different vaginal hygiene practices that seem to predispose them to HPV infection (van Andel et al., 2008; Leckie, 2010). Within the Maroon culture having multiple partners and sharing them is well accepted, which increases the risk of an HPV infection and consequently cervical dysplasia and/or cancer. With all this in mind there is still no explanation for the low cancer and cancer mortality rates. The cancer incidence was even lower than the average, suggesting possible protective factors for cervical cancer, either genetic or behavioral.

*The Indigenous women*

The Indigenous people are just a small part of the population (< 4%). According to the ABS during the 7th Census of 2004, 40% was living in Paramaribo, 30% in the rural-coastal districts and 30% in the interior. Most live in the districts Paramaribo, Para and Sipaliwini (Algemeen Bureau voor de Statistiek, 2005). The Indigenous population is not a single, homogeneous entity; a major feature is their diversity. All over the world Indigenous people (especially in Latin America), show great disparities in health and disease statistics. Important issues are the over-representation among the poor and disadvantaged (socio-economic status), marginalization (the forgotten population) with scarce and inadequate data on health and the development of chronic diseases due to adaptation to more westernized lifestyles and acculturation. They still have a heavy infectious disease burden leading to increased infant mortality. Pregnancies at a young age and multiple pregnancies, high risk sexual activities are all identified risk factors together with transmigration to urban areas with worldwide known effects such as acculturation and rapidly changing lifestyles (Reath & Carey, 2008; Gracey & King, 2009).

Krul et al. (1996) found in her study on cervical cancer an excess risk for developing cancer among the Indigenous and the Javanese. An earlier study done on cervical cancer showed an increased incidence among Indigenous and Chinese women (Vrede & Sabajo, 1987). No sensible explanation was found for these ethnic distribution differences. A Guyanese study in 2009 also found a high incidence for cervical cancer in Indigenous women and risk factors that were found to be relevant included high parity (more than 4 children), age at first intercourse, hr-HPV prevalence of 22.8% together with a low socio-economic status and limited access to health services (Best Plummer, Persaud, & Layne, 2009). Other regional studies have shown the same problems to be the cause of the excess risk (Hurtig & San Sebastián, 2002; San Sebastián & Hurtig, 2004). Australian studies on their Indigenous
population found the main contributors for the excess risk in incidence and mortality to be lack of screening due to poor access and utilization of preventive health services and living in rural remote areas and delayed diagnosis of cervical cancer (late stage disease). Australian Indigenous people were less likely to receive adequate treatment and were more likely to die. Other established risk factors for cervical cancer such as cigarette smoking and early onset of childbearing were highly prevalent (O'Brien, Bailie, & Jelfs, 2000; Condon et al., 2003; Cunningham et al., 2008).

According to a study in 2008 in Suriname Indigenous people are not much different than in other parts of the world. The issue of acculturation and changing sexual behavior as a consequence make these women vulnerable (Heemskerk & Uiterloo, 2008). Among the well-known identified risk factors that could explain at least in part the higher risk for cervical cancer and cervical cancer death are sexual intercourse at an early age (younger than 16 years), frequent casual sexual relationships and early age pregnancies (mean age of 16 years). Other risky behavior identified in this study that could increase exposure to HPV or other STI’s are the development of commercial sex, frequent cases of sexual abuse and especially endogenous marriages (Heemskerk & Uiterloo, 2008). Leckie did not find the same behavioral and cultural risk factors among these woman, as in Maroon women but the Indigenous women also had a tendency to less screening, probably due to less accessibility of the health system (Leckie, 2010).

Ethnic differences could be partly explained by limited access (living in the remote interior) to health services and delayed diagnosis (Krul et al., 1996). Other established risk factors for cervical cancer like high parity, age at first intercourse, smoking habits, use of oral contraceptives, participation rates seem to play an important role in these ethnic subpopulations and further in depth research among these groups should yield more explanations. As Leckie concluded in his research, culture has a considerable impact on risk behavior. Culturally accepted sexual behavior that could be different, but risk-increasing together with the fear among women to participate in screening programs for cervical cancer are important determinants of screening behavior and should be studied more among subgroups for a more targeted health education (Leckie, 2010).

The use of secondary data limits this study on several issues. First the data available for cervical dysplasia, cervical cancer and cervical cancer mortality did not represent the same
time periods. Comparisons and correlations are then limited. Second, data were missing from the dysplasia database. Information on ethnicity and geography was missing from the records for about 20% of the total dataset. The interpretation of the calculated estimates for ethnicity should therefore be performed with caution. Furthermore, the issue of misclassification by using self-identification and guesswork should make these data even less valid. Even so, the results do indicate a great difference in ethnic distribution for cervical dysplasia and cervical cancer that needs further exploration. Third, the population statistics used in this study are in some cases very rough estimates on the high side, for age- and ethnic distribution were not available for all years covered in this study. This could mean that calculated estimates are underestimations of the true incidence or mortality.
Conclusions & Recommendations

The results from this study reveal that screening practices in Suriname had so far very limited or no impact on cervical cancer incidence and mortality in the country. The occurrence of cervical dysplasia cannot be extrapolated to the entire population because of low national screening coverage and low specificity of the method used. Although the reported incidence of cervical cancer showed a decline, the mortality due to this cancer has remained the same over the last decades. This means that Suriname still has and for many years will have a serious Public Health problem with cervical cancer.

In summary, high-risk groups have been identified among age groups and ethnic subpopulations. This information can be used for improving existing screening practices with targeted screening.

This study shows furthermore that there are important differences among subgroups within the female population with respect to the occurrence of cervical dysplasia, cervical cancer incidence and cervical cancer mortality. The age continuum of the development of cervical cancer from cervical dysplasia is in accordance with the results and shown in previous studies on natural history, which means that screening can be targeted based on age.

Furthermore, several ethnic subpopulations have shown differences in risk for the development of cervical cancer and the risk of death due to cervical cancer, in particular the Indigenous women followed by the Creole women. The Maroon women on the other hand, show a very low risk. Although they share some of the fore mentioned behavioral risk factors, there are differences. These could be cultural, environmental and probably genetic as well.

The results from this study are usable for improving screening practices in Suriname. In light of limited resources and lack of efficacy of the current screening activities, targeted screening at the moment seems to be the best option.

Screening can be targeted at the high-risk age groups, e.g. women aged 30-49. The program can start with a small target population than currently practiced and increase coverage to at least 80%. A call – and appointment system needs to be in place to remind women turning 30...
of their need for screening. With better resources and increased coverage the target population can be broadened to the 20-59 group. No screening is necessary before the age of 20.

Screening services should be made more accessible, especially to women in the rural and remote areas. As was mentioned before, the Lobi Foundation covers 85% of all screenings, the rest of the screening takes place in secondary health care systems. It should be encouraged that screening mostly takes place at the primary care level. When high-grade dysplasia or cervical cancer lesions are detected referral to the secondary level is obligatory.

Special attention should be directed to vulnerable cultural and ethnic subpopulations such as the ones identified. Screening and health education practices should be tailored and targeted to the similarities and differences found.

Despite the limitations of this study on cervical dysplasia and cervical cancer, both diseases are clearly an important health issue for Suriname and especially the Indigenous and Creole women. Cervical cancer is largely preventable if detected in its early phase. The reasons for the different patterns in the different ethnic subpopulations are not yet clear and need to be further investigated. Also, improvements in data quality and availability are still needed to monitor risk factor patterns, identify variations and assess screening programs. Disease registries, especially cancer registries need to be put in place.

Further research should focus on identifying risk factors for cervical dysplasia and cervical cancer in the female population, in depth exploration of the identified high-risk ethnic subpopulations, high-risk HPV prevalence, treatment and follow-up of high-grade cervical lesions and cervical cancer (treatment failure, recurrence of CIN, cancer survival).
References


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