

IS THERE AN INCREASE IN STDS DURING CARNIVAL? TIME SERIES OF DIAGNOSES IN A STD CLINIC

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ABSTRACT

OBJECTIVE. Sexually transmitted diseases (STDs) are common reasons for seeking medical assistance. Media campaigns on STD/AIDS assume that exposure to risky sexual practices is greater during Carnival. The objective of this study was to analyze the temporal distribution of first appointments in a STD clinic from January 1993 to December 2005 to verify whether there is a seasonal increase in STD after Carnival.

METHODS. A total of 2,646 medical records with a diagnosis of gonorrhea, syphilis, or trichomoniasis were selected among patients seeking medical assistance in the STD Unit of Universidade Federal Fluminense, Niterói, Rio de Janeiro, Brazil. Statistical analysis was performed using month-to-month and year-to-year standardized average number of appointments during 13 years, in addition to smoothed time-series data using the Lowess method and the deterministic moving average method.

RESULTS. July and August exhibited the largest number of gonorrhea and syphilis diagnoses, and June and July of trichomoniasis diagnoses. Gonorrhea had its peak value in May, with a falling trend until August. A constant number of syphilis diagnoses was observed between May and August, with smaller numbers in January and February and peak values in November. The seasonal pattern for trichomoniasis diagnosis showed peak values in July, with a consistent falling trend until December and an increase from January on.

CONCLUSION. Carnival has no influence on the increase in the occurrence of gonorrhea, syphilis, and trichomoniasis in patients attending a STD clinic in Niterói, Rio de Janeiro, Brazil.

KEY WORDS: Sexually transmitted diseases. Epidemiology. Syphilis. Gonorrhea. Trichomonas vaginitis.

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INTRODUCTION

The World Health Organization (WHO) estimates that more than 340 million new cases of four classic curable sexually transmitted diseases (STDs) – trichomoniasis, chlamydial infection, gonorrhea, and syphilis – occur each year worldwide.^{1,2,3,4,5}

In Brazil, about 4,400,000 new cases of trichomoniasis, 1,967,200 of chlamydial infection, 1,541,800 of gonorrhea, and 937,000 of syphilis are estimated to occur annually, since the only STDs requiring mandatory reporting are

congenital syphilis, syphilis in pregnancy, AIDS, and HIV in pregnancy.^{1,2,3,4}

In developing countries, sexually transmitted infections (STIs) are a major determinant of disease expression in the population. Many of these infections have a complex set of factors caused by various microorganisms with very specific development and clinical expression, which may have a predominantly or entirely asymptomatic course; however, the term STD refers solely to symptomatic cases.^{6,7}

The importance of STDs is linked both to their clinical complications and to the fact that they are facilitators of HIV

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transmission, since they may cause an 18-fold increase in the risk of HIV infection. HIV infection may alter the natural course of STDs, leading to the establishment of a more severe and difficult-to-treat condition. Syphilis in pregnant women often causes congenital syphilis, a disease with major repercussions for the family and the community.^{2,3,5,8,9}

The Carnival festivities have long been related to permissive behavior, with components containing strong sexual appeal, which would lead to an increased risk of individuals contracting STIs.¹⁰

Reports of parties with carnival features are found in the traditions of ancient civilizations. Such celebrations were brought to Brazil by the Portuguese and became popular only when elements of African origin were incorporated.^{11,12}

Public strategies to control and reduce infections/diseases have as their starting point not the recognition of increased reporting, but the recognition of the existence of information/component factors present in the pre-pathogenic period, which could indicate a higher probability of occurrence. Thus, campaigns disseminated in the media based on programmatic elements of the National STD/AIDS Control Program of the Brazilian Ministry of Health begin one week before Carnival and end on Ash Wednesday.¹³

The first report of an official mass media campaign during Carnival dates from 1995, with a campaign entitled "AIDS – love". Thousands of condoms were distributed in places where Carnival parties took place, taking into account that the Brazilian Carnival, considered the most popular party in the world, allegedly leads to an increased number of STD/AIDS cases to justify the need for prevention campaigns specifically at this time of the year.¹⁴

Therefore, the present study aimed to analyze the temporal distribution of first appointments in the STD Unit of Universidade Federal Fluminense (STD Unit/UFF), a STD clinic, from 1993 to 2005, to verify whether there is a seasonal increase in diagnoses of gonorrhea, syphilis, and trichomoniasis resulting from contamination during Carnival.

Patients and methods

This is a time series analysis of diagnoses of syphilis, gonorrhea, and trichomoniasis in male and female patients, at various age groups, who sought medical assistance in the STD Unit/UFF, Niterói (RJ), Brazil, for the first time between January 1993 and December 2005.

The STD Unit/UFF is a center for clinical care, teaching, and research in the area of STD which receives throughout the year people referred by public assistance (municipal, state, and federal) and private practice, as well as by spontaneous demand.

The database contains information from medical records of patients attending the unit. All data were entered by examiners/raters (healthcare professionals) using the same training and healthcare protocol. However, as in any research that uses medical records, this may be a limitation.

We used pretested, standardized forms for data collection, which have been used in various surveys conducted in the STD Unit/UFF.^{8,15}

Definition of STDs under study

Gonorrhea

It is caused by a bacterium, *Neisseria gonorrhoeae*, which is found in the form of Gram-negative intracellular diplococci, being sensitive to most antiseptics and easily dying outside their natural habitat.^{1,3,8}

The incubation period is 2 to 10 days, but there are cases of onset of symptoms 12 hours after contact.^{1,3,8,9}

In men, it is characterized by purulent discharge with pain and burning sensation when urinating. Some women have only a few symptoms or a clinical status typical of purulent endocervicitis.^{1,3,8,9}

The most common diagnostic methods include Gram's staining technique, which reveals intracellular diplococci within polymorphonuclear leukocytes, and gonococcal culture medium (Thayer-Martin medium) of genital tract specimens (urethral discharge and endocervical mucosa). It was considered a case when one or both methods were positive.^{1,3,9}

Syphilis

Syphilis, also known as "hard chancre" and Lues, is caused by a spirochete, *Treponema pallidum*, which has humans as the only vector and host. The incubation period ranges from 21 to 30 days.^{1,2,8,16,17}

It is widely accepted that only recent syphilis (chancre adenitis = primary syphilis; and rash/papular stage = secondary syphilis) is infective. These stages are characterized by a large number of treponemas present in the lesions.^{1,9}

The gold standard for diagnosis of syphilis is finding the etiologic agent in the lesion using the classic technique of dark field microscopy.^{1,3,8,9,17}

Other diagnostic methods include detection of antitreponemal antibodies by non-treponemal tests, such as Venereal Disease Reference Laboratory (VDRL), and treponemal serological tests, such as fluorescent treponemal antibody-absorption (FTA-Abs).^{1,2,3,8,18}

The cutoff point for negative VDRL was 1:4. In these cases a treponemal test was always performed to confirm the diagnosis.

Trichomoniasis

It is caused by the protozoan *Trichomonas vaginalis*, with an incubation period ranging from 1 to 2 weeks.^{1,2}

In the genitourinary tract of women, it can cause a yellow, itchy, foul-smelling vaginal discharge.^{1,8,9}

In men, the infection seems to be self-limiting. It may be asymptomatic or mild symptomatic, which is clinically indistinguishable from other forms of urethritis, causing dysuria, itching, and penile ulceration with a burning sensation after intercourse. Complications are rare, but can include prostatitis, epididymitis, and infertility.^{1,19,20,21}

The gold standard for diagnosis is culture medium. However, it is not widely available. The most common method of detection is by direct observation of fresh smear, which has 100% specificity. In medical practice, trichomoniasis is most often diagnosed by routine cytologic smear of genital tract specimens.^{1,8,9,22,23,24,25}

METHODOLOGY

After all medical records were reviewed and variables were coded, data were entered into an Excel spreadsheet and analyzed using Open Source R software, version 2.5.1.40.

Standardization of the number of appointments

Analyses were performed using data standardized per working day of each month of each of the 13 years studied. National, state, and city holidays were considered as nonworking days.

The standardized number of appointments was obtained by multiplying the number of appointments per month of each year by the ratio between the largest number of days worked in different months of that year and the number of days worked during the month in question.

Time series analysis

Initially, data analysis was performed by decomposition of the time series into seasonal components, trend, and irregular components using the Lowess (locally-weighted scatterplot smoothing) modeling method, in which a polynomial determined by numerical predictors is fitted by local adjustment.

The seasonal component was evidenced by Lowess smoothing of the monthly subset of data. Seasonal values are removed and smoothing of the remaining data adjusts the trend. The remaining component is the residual of the adjustment, or seasonality and trend white noise. This is an interactive process.

The general pattern of seasonality was then estimated by coherent average (averaging) of the number of appointments per corresponding months over all years. A low-pass filter (moving average of five samples centered on the current sample, i.e., non-delay filter) was applied previously to attenuate random variability of the time series. This procedure results in a mean seasonal value for the set of years analyzed, unlike the Lowess method which shows year-to-year seasonality.

The study was approved by the Research Ethics Committee of Universidade Federal Fluminense, Brazil (protocol no. 023/2005).

RESULTS

From January 1993 to December 2005, 11,092 medical records were entered into STD Unit/UFF database. Of these, 755 (6.8%) were incomplete and were discarded. Of the remaining 10,337, 2,646 (25.59%) described patients with a diagnosis of gonorrhea, syphilis, or trichomoniasis and were then included in our study.

The study population was composed of men (1681/63.5%) and women (965/36.5%) at the following age groups: 0-9 (15/0.6%); 10-19 (560/21.2%); 20-59 (2043/77.1%); and 60 or older (28/1.1%).

Regarding the place of residence: 1279 (48.3%) lived in Niterói; 1000 (37.8%) in São Gonçalo; 166 (6.3%) in Rio de Janeiro; 96 (3.6%) in Itaboraí; 96 (3.6%) in other cities; and 9 (0.3%) place unknown.

The rates of gonorrhea, syphilis, and trichomoniasis by month and year are described in Table 1.

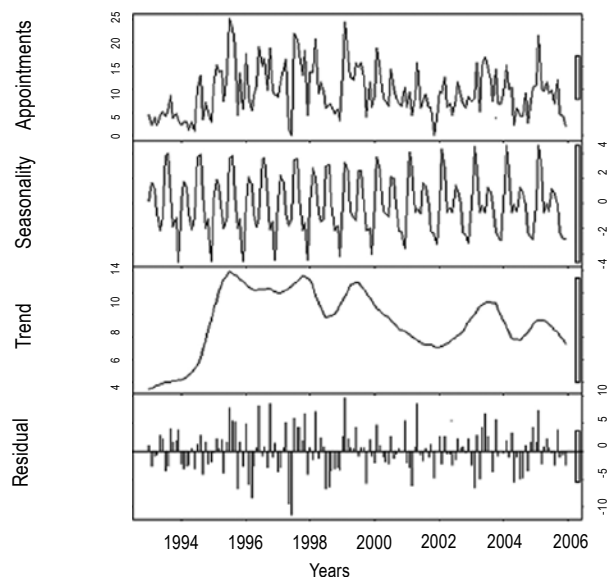
In order to achieve our goals, we observed the standardized average number of appointments for 13 years, month-to-month and year-to-year standardized series of appointments, and smoothed time-series data using the Lowess method and the deterministic moving average method. None of the methods used revealed, for any of the three diseases, a higher number of cases in February/March/April, the period immediately after Carnival, which includes the incubation period for the three classic curable STDs (gonorrhea, syphilis, and trichomoniasis).

Decomposition of the series of first appointments into seasonality, trend, and white noise, for patients diagnosed with gonorrhea, syphilis, or trichomoniasis, is shown in Figures 1, 2, and 3. In these figures, the upper graph corresponds to the gross number of appointments over the months, while the lower graphs indicate decomposition of this time series into seasonality, trend, and residual (white noise), from top to bottom, respectively.

We can observe that the seasonal component of the series (not associated with Carnival days), although showing a small amplitude, corresponds to about 1/3, 1/4, and 1/5 of the magnitude of variation of the gross series of first appointments standardized for gonorrhea, syphilis, and trichomoniasis, respectively (see vertical numeric scales of these graphs). The trend component also has little influence on the three series studied. A greater number of cases can be clearly observed between 1995 and 1999. The random component, or white noise, has the greatest influence on the variation of the series.

The coherent average (averaging) of the number of first appointments, standardized per corresponding months over all years, allowed us to observe only the variation resulting

Figure 1 - Decomposition of the series of first gonorrhea appointments in the STD Unit/UFF – 1993 to 2005



from the relationship of close months of each year, showing a seasonal average of all years for each of the three diseases (Figure 4).

Gonorrhea (Figure 4a) had its peak value in May, with a falling trend until August; between August and November, the number of diagnoses varies slightly, but with no clear trend of reduction or increase. The numbers fall from November until January, when they reach the minimum.

A constant number of syphilis diagnoses was observed between April and December, with smaller numbers in January and February and peak values in November (Figure 4b).

The seasonal pattern for trichomoniasis diagnosis was

slightly simpler than that for gonorrhea, displaying peak values in July and a consistent falling trend until December, when numbers reach the minimum, followed by an also consistent increase from January until July (Figure 4c).

DISCUSSION

For lack of publications on the subject, we were unable to compare our results. Nevertheless, we believe that this study will serve as a basis for other research groups so that the issue becomes more visible and the actual magnitude of the situation is expressed. This is because the lack of similar

Figure 2 - Decomposition of the series of first syphilis appointments in the STD Unit/UFF – 1993 to 2005

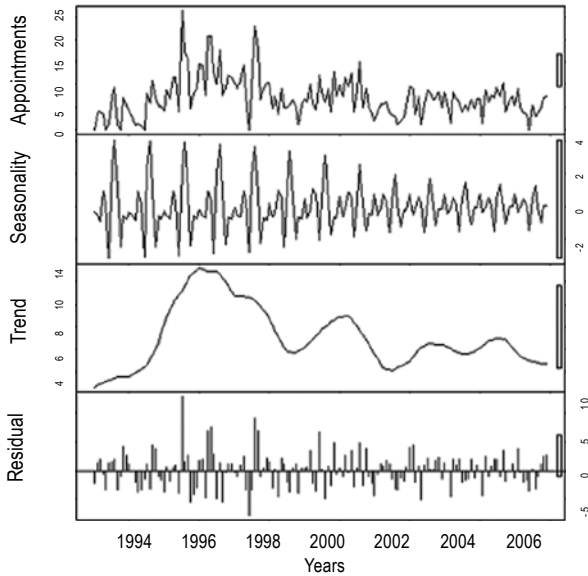


Figure 3 - Decomposition of the series of first trichomoniasis appointments in the STD Unit/UFF – 1993 to 2005

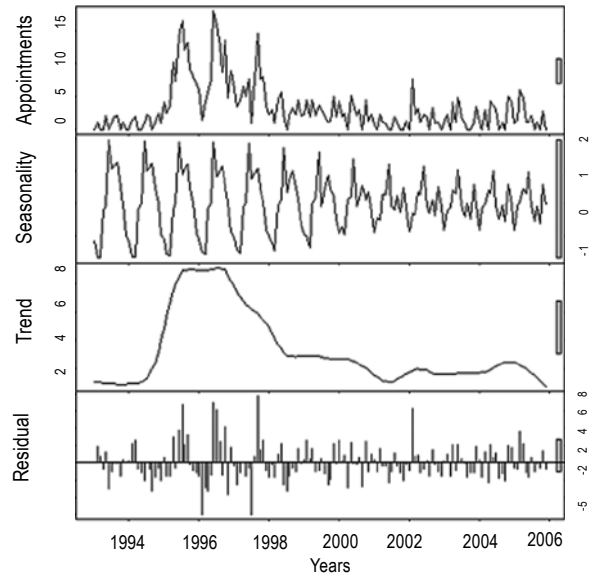


Figure 4 - Appointment seasonality of patients diagnosed with gonorrhea (a), syphilis (b), or trichomoniasis (c) in the STD Unit/UFF – 1993 to 2005

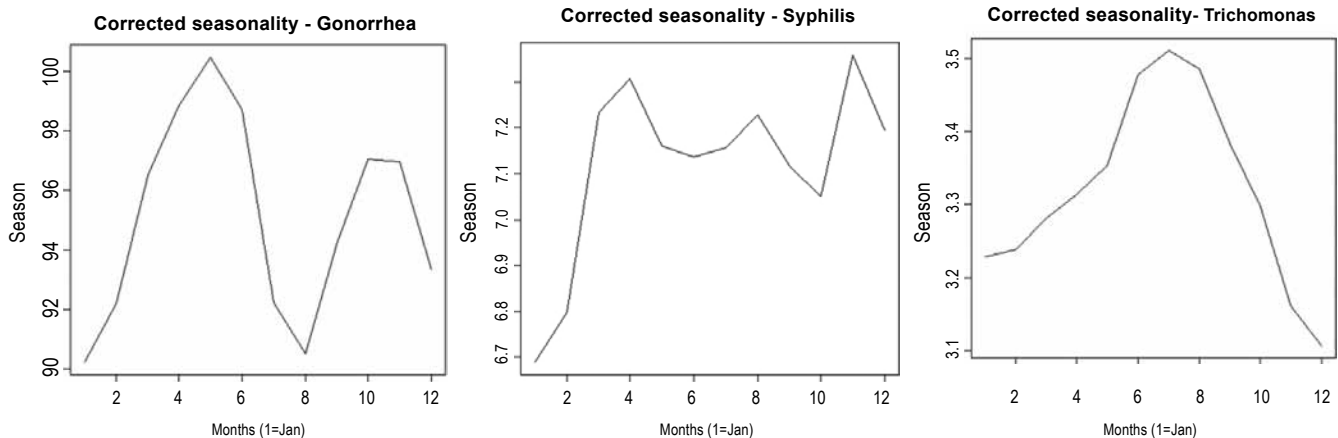


Table 1 - Distribution of first appointments of patients diagnosed with gonorrhea, syphilis, or trichomoniasis by year and month, separately, in the STD Unit/UFF: 1993 - 2005

TIME PERIOD	NO. OF APPOINTMENTS 1ST TIME		GONORRHEA		SYPHILIS		TRICHOMONIASIS	
	No.	%	No.	%	No.	%	No.	%
Year								
1993	407	3.94	47	11.55	39	9.58	9	2.21
1994	469	4.54	50	10.66	46	9.81	12	2.56
1995	1173	11.35	144	12.28	112	9.55	93	7.93
1996	1504	14.55	134	8.91	141	9.38	97	6.45
1997	1263	12.22	137	10.85	117	9.26	69	5.46
1998	689	6.67	97	14.08	60	8.71	29	4.21
1999	618	5.98	138	22.33	81	13.11	29	4.69
2000	766	7.41	106	13.84	90	11.75	28	3.66
2001	577	5.58	74	12.82	39	6.76	9	1.56
2002	796	7.70	87	10.93	71	8.92	20	2.51
2003	775	7.50	115	14.84	62	8.00	19	2.45
2004	619	5.99	79	12.76	75	12.12	23	3.72
2005	681	6.59	95	13.95	49	7.20	19	2.79
Month								
January	839	8.12	112	13.35	85	10.13	28	3.34
February	725	7.01	119	16.41	65	8.97	23	3.17
March	866	8.38	131	15.13	77	8.89	31	3.58
April	754	7.29	99	13.13	90	11.94	39	5.17
May	870	8.42	99	11.38	84	9.66	40	4.60
June	738	7.14	93	12.60	50	6.78	51	6.91
July	1091	10.55	149	13.66	108	9.90	49	4.49
August	1078	10.43	149	13.82	122	11.32	45	4.17
September	951	9.20	115	12.09	88	9.25	45	4.73
October	875	8.46	88	10.06	62	7.09	37	4.23
November	843	8.16	81	9.61	72	8.54	37	4.39
December	707	6.84	68	9.62	79	11.17	31	4.38
TOTAL*	10337	100	1303	12.61	982	9.50	456	4.41

* The total is higher than 2646 because there are patients with more than one diagnosis.

% in relation to first appointment.

studies hinders the visibility of the problem, which guides the implementation of priority interventions and subsequent evaluation of their effectiveness.

Our concern with this issue resulted in a further, wider, and better analyzed extension of a previous study in which no statistically significant differences were observed in the occurrence of STDs before and after Carnival in the same medical center we are acting. In that study, only the statistical analysis of percentage of diagnoses was performed, without, however, using appropriate methods for a time series analysis.¹⁰

We analyzed whether the highest peaks of diagnosis coincided with the expected peaks of clinical manifestation of each disease studied (March/April) if contamination had occurred during Carnival (February/March).

We used the number of appointments in the STD Unit/UFF as an estimator of the incidence of cases in the population potentially using the services available. However, some aspects should be discussed to accept the validity of this assumption. Firstly, the number of appointments reflects the incidence of individuals with clinical manifestations and not the number of infected subjects, which makes the number of individuals seeking health care a good estimator of the number of infected individuals. A second factor could be the variation in the number of appointments made available for the population. We are aware that demand depends on necessity (onset of signs and symptoms) and supply.¹⁵

This is a time series analysis, based on data from secondary sources, conducted in a single reference medical center for the diagnosis and treatment of STD. In fact, other health services may be sought for the treatment of these diseases, such as obstetric and gynecologic services and Primary Healthcare Units.

These data are limitations of our study. However, one must question: how many obstetric-gynecologic services and Primary Healthcare Units have conditions suitable for immediate care and clinical and laboratory diagnosis (professionals specialized in fresh smear techniques, Gram's staining technique, analysis of *Treponema pallidum* under dark field microscopy, treponemal and non-treponemal serological tests, stained cytology, and gonococcal culture) of the STDs studied?

In general, service delivered in healthcare facilities that treat STD cases is based on the syndromic approach, which is incompatible with the routine etiologic diagnosis.

The idea behind large media campaigns on STD/AIDS is based on the assumption that exposure to situations of vulnerability (unprotected sex and unplanned pregnancy) is greater across the Brazilian population during Carnival, since such campaigns are not promoted at another time of the year.

Over the 13 years studied, Carnival occurred in February in 11 years and in March in only two years (March 7, 2000 and March 4, 2003), thus justifying that STDs transmitted during Carnival are likely to be diagnosed in March/April.

We found a publication evaluating media campaigns to fight AIDS in Brazil.²⁶ The study is a nationwide survey conducted immediately after the 2003 Carnival, but interviewing only girls aged 13-19 years. The results revealed that the campaign has important effects, such as stimulating discussions among young people and strengthening positive

attitudes toward condom use. However, that study failed to make a comparison with another time of the year and an analysis of the number of STD cases prevented and the number of cases that occurred.

We observed that the number of first appointments for gonorrhea, syphilis, and trichomoniasis was higher between 1995 and 1997, when the STD Unit/UFF was open to the public in the morning and afternoon, unlike other years when it was open only in the morning. This fluctuation in appointments showed that numbers varied according to the availability of services, but without altering the proportion of diagnoses. However, none of these years, in the case of the three diseases, had a higher frequency of appointments in March and April (Table 1).

During the years studied, the number of appointments in the STD Unit/UFF was stable throughout all months and years. The number of working days varies from month to month, not only due to the absolute number of days that can range from 28 to 31, but because of holidays, occurring more often in February, April, and December, which could bias our analysis. Based on that, we could consider that people who failed to schedule an appointment in February would seek assistance in March and so on.

These observations make us accept the premise that the variation in the number of monthly appointments held during the years studied was a good estimator of the incidence of cases in the population that would use this service if necessary.

According to the deterministic method, peaks occurred in May, September, and November in the case of gonorrhea (Figure 4a), in April, August, and November in the case of syphilis (Figure 4b), and a single peak in July in the case of trichomoniasis (Figure 4c), suggesting that the low seasonality observed by Lowess is not associated with Carnival. This observation clearly indicates that an allegedly higher contamination during Carnival did not generate more appointments in the STD Unit/UFF, thus failing to confirm the hypothesis that Carnival would generate a greater number of contaminations.

Lopes et al.²⁷, in a cross-sectional analytical survey conducted with 752 revelers during the 1997 Carnival in the city of Rio Branco, state of Acre, northern Brazil, concluded that there was no significant increase in the frequency of sexual intercourse during Carnival, but the authors observed an increase in the number of intercourses with other partners, including mate swapping. They concluded that the practice of carrying condoms was higher during Carnival, suggesting that at this time of the year people realize the risk of having casual sex and, therefore, take precautions. However, that study did not consider seasonality, was not compared to another time of the year and did not analyze clinical diagnoses of any medical service or data from injury reporting, which reduces the strength of their results.

Hughes et al.²⁸, also investigating risk-taking behavior during Carnival, interviewed by means of a questionnaire 380 male samba school drummers from São Paulo (SP), Brazil, in 1993. The authors reached the following result: only 9.7% of all study subjects were at risk of HIV infection only during Carnival. They concluded that those who were at risk only during Carnival did not differ from those who were at risk at

other times. This reinforces the understanding that those who are at risk during Carnival are at risk throughout the year.

As an example that public health campaigns on STD/AIDS, to yield good and long-lasting results, should be continuous throughout the year (or years), we mention the study by Angus et al.²⁹, in which the authors concluded, after analyzing general population campaigns and self-help initiatives and awareness among homosexual men in England, that such interventions contributed significantly to a fall in HIV transmission and that sexual health initiatives need to be better understood and reinvigorated.

In Brazil, Lima et al.³⁰, in a publication on mass media campaigns on STD/AIDS from the federal government, reinforce that the schedule is fixed and shows inattention to other STDs, contributing only to build the imagery of AIDS on the national scene.

More intensive prevention campaigns at this time of the year may be reinforcing the belief that Carnival is synonymous with general sexual promiscuity. What could also lead to the belief that prevention is more important at this time of the year, with no relevance in the remainder of the year, thus leaving the population more vulnerable to STD/AIDS, yet there is no consensus on the criteria that define a mass media campaign as efficient or successful.

Finally, the technique of time series analysis is a useful tool for future predictions, allowing us to know the expected frequency of diseases, as well as allowing better planning of the necessary interventions in order to improve the planning of the distribution of material resources and personnel. In addition, the existence of a prior projection, compared with current data obtained after the intervention, may also be useful in complementing the analysis method.

The power of media to show incessantly, for nearly a week, revelers in skimpy outfits and sexy dance causes a blackout in our minds to forget that at these parties, especially in the Samba School Carnival, there are also the "Baianas" wing (a group of elderly ladies), children, opening wings (formed by distinguished samba-school members), old guard (a group of elderly, often retired, samba-school members), composers' wing, percussionists, support staff, vendors, journalists, among many other occupations and professions that spend all their time concerned with Carnival business interests quite different from sexual activities. Another important issue concerns the large number of people traveling to places far from the parties reported in the media, completely remote from the Carnival celebrations. This number might be even higher than that of people attending the Carnival celebrations.

The failure to statistically establish that the Brazilian Carnival, considered the most popular party in the world, leads to a significant increase in the number of STD/AIDS cases, coupled with campaigns of condom use specifically at this time of the year, may reinforce the belief that Carnival is synonymous with general sexual promiscuity.

The analysis performed in the present study indicates that no more cases of gonorrhoea, syphilis, and trichomoniasis were diagnosed after Carnival, respecting their incubation periods, in a reference medical center for STD in the city of Niterói (RJ), Brazil.

Nevertheless, further studies are needed to determine, for other regions of the country, if people at risk during Carnival are also at risk throughout the year or at specific times of the year, as well as if such condition is sufficient to change statistically and significantly the number of STD contaminations.

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