Green, yellow and red hours to go to the beach

Horas de color verde, amarillo y rojo para ir a la playa

To the Editor:

Exposure to sunlight, whether intentional or for recreational purposes, especially during the holidays, tends to occur at the beach. Simple rules such as spending more time in the shade not spending more time than necessary are useful at all latitudes and times of year. The Portuguese Skin Cancer Association (http://www.apcancrocutanoe.pt) developed a traffic-light system in 2005 to raise awareness in the population about the best times for sunbathing (Fig. 1), with green before 11 AM and after 5 PM, amber between 11 AM and 12 PM and between 4 PM and 5 PM, and red between noon and 4 PM. Since then, copies have been sent every year to many of the country’s beaches during the months of July and August.

To access the behavior of the population, a cross-sectional study was carried out between July 18, 2009 (maximum temperature, 32°C; UV index, 10) and July

![Sun clock](Figure 1)
12, 2014 (maximum temperature, 30°C; UV index, 9) at Vilamoura beach, one of the most frequented beaches in Portugal’s Algarve region, with approximately 5000 visitors per day in July and up to 10000 visitors per day in August. Between 90% and 95% of people who visit the beach do so by crossing a particular bridge, which was the ideal place for recording arrivals and departures. At one end of the bridge, a team of 3 pharmacists recorded arrivals each hour, on a computer, between 8 AM and 8 PM, while another team recorded departures. Approximate ages were evaluated and divided into groups of under 16 years of age, between 16 and 24 years of age, between 25 and 40 years of age, and over 40 years of age. Proportions were compared using the $\chi^2$ test of independence.

A team of dermatologists and volunteers worked together to promote rules for safe sunbathing, distribute information leaflets with photographic information on skin cancer and self-examination of the skin.

Table 1 shows the arrivals and departures, by age group, in the 8-11 AM, 11 AM-5 PM, and 5-8 PM time intervals, and in the 8-12 AM, noon-4 PM, and 4-8 PM time intervals, in 2009 and 2014.

In general terms, the number of arrivals between 8 AM and 11 AM improved from 2009 to 2014 (from 26% to 30%, $P < .001$).
Improvement was found in the group of visitors under 16 years of age (from 23% to 37%, \( P < .001 \)) and the group aged between 16 and 24 years (from 10% to 19%, \( P < .001 \)); this was not the case for the group of visitors aged between 25 and 40 years (from 27% to 21%, \( P < .001 \)).

The number of arrivals in the amber and red time intervals was higher in the group aged between 16 and 24 years (72% in 2009 and 73% in 2014), but worsened in the group aged between 25 and 40 years (from 53% to 59%, \( P < .001 \)). Analysis of the hours in red (noon to 4 PM) showed that the group aged between 16 and 24 years was the worst in 2009 (37%) and was even worse 5 years later (44%, \( P < .001 \)). The same occurred in the group aged between 25 and 40 years (from 27% to 33%, \( P < .001 \)).

Despite the limitations of the study (such as the small sample size and the confidence in the method for calculating age), the data reveal important findings. A large percentage of the population arrived at the beach during the amber and red time intervals (between 11 AM and 5 PM) (56% in 2009 and 53% in 2014).

A greater number of arrivals and a smaller number of departures was observed. This may be because of the large number of people who remained on the beach until sunset (approximately 9 PM at that time). All our campaigns are designed to encourage people to enjoy the beach at the end of the day until sunset.

The fact that the vast majority of people entered the beach between noon and 4 PM, with the highest numbers recorded among young people aged between 16 and 24 years, underscores the need to raise awareness regarding the need to wear hats and clothing that protects the torso and upper extremities, sunglasses and, particularly, to shelter under good shade, ideally tents, at times of greatest risk or more than 1 or 2 hours after the last application of sunblock.

Many measures aimed at preventing skin cancer have led to greater knowledge and awareness of exposure to the sun and skin cancer.\(^1\)\(^2\)\(^3\) The change in behavior is, however, slow and insufficient, especially among young adults.\(^2\)\(^-\)\(^7\)

Prevention strategies must be adapted to each age group.\(^8\) Lifeguards and celebrities from the world of fashion and sport are good role models for protection against exposure to the sun and can be powerful allies for raising awareness among young adults.\(^9\)\(^-\)\(^10\) The use of the media as a platform for amplifying the message is of inestimable value.

Our intention is to continue to use the sun clock to attract the attention of younger people and to encourage older people to take responsibility when they see this warning on entering and leaving the beach.

**Conflicts of Interest**

None of the authors have declared a conflict of interest.

**References**


O. Correia,\(^a\)\(^b\)\(^c\)\(^d\) A.F. Duarte,\(^a\)\(^b\)\(^e\) A. Picoto\(^b\)

\(^a\) Centro de Dermatologia Epidermis, Instituto CUF, Sra da Hora, Portugal
\(^b\) Asociación Portuguesa de Cáncer de Piel, Oporto, Portugal
\(^c\) Unidad de Inmunología, Facultad de Medicina, Universidad de Oporto, Oporto, Portugal
\(^d\) CINTESIS, Center for Health Technology and Services Research, Universidad de Oporto, Oporto, Portugal

\(^e\) Corresponding author.

**E-mail address:** duarte.af.t30@gmail.com (A.F. Duarte).

https://doi.org/10.1016/j.adengl.2018.01.006

© 2018 Elsevier España, S.L.U. and AEDV. Published by Elsevier España, S.L.U. All rights reserved.