

# Experience of Health-Related Problems during House Parties in the Netherlands: Nine Years of Experience and Three Million Visitors

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#### Abbreviations:

MUR = medical usage rate  
PTTT = patients per ten thousand

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#### Abstract

**Objective:** The objective of this study was to report on a nine years of experience of providing medical support during house parties (raves) in the Netherlands, where they can be organized legally.

**Design:** This was a prospective, observational study of self-referred patients from 1997 to 2005. During raves, first aid stations are staffed with specifically trained medical and paramedical personnel. Self-referred patients were diagnosed, treated, and recorded using standardized methods.

**Results:** During a nine-year period with 219 raves occurred, involving approximately three million participants, 23,581 patients visited the first aid stations. The medical usage rate (MUR) varied from 59–170 patients per 10,000 rave participants. The mean age increased from 1997 to 2005 from 18.7 ±2.7 to 23.3 ±5.7 years. The mean stay at the first aid station was 18 ±46 minutes. Most health problems were mild. Fifteen cases of severe incidents were observed with one death.

**Conclusions:** Unique data from the Netherlands demonstrate a low number of serious, health-related, short-term problems during raves.

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#### Introduction

Since the early 1990s, dance has evolved as a specific music culture. Each year, approximately 800,000 youngsters in the Netherlands visit dance parties, also known as house parties or raves. Raves are events held in exhibition centers, sports halls, and outdoor recreational areas that involve 500 to 60,000 visitors. At night, these parties usually last 9–10 hours. In the summer, raves are organized during the day and last 11–14 hours. From 1996 to 2005, an increased number of visitors to house parties was observed. The number of raves increased as well as the average number of visitors per house party.<sup>1</sup> Several studies have indicated that the use of recreational drugs during house parties is common, and the majority of visitors, mostly youngsters, uses one or more drugs.<sup>2–6</sup> Although data are lacking, health-care authorities and public opinion consider these events as a threat to health. Therefore, raves are prohibited in most countries. Currently, the Netherlands is an exception, because at every legal rave, an effective medical service system is available. A first aid station, staffed by nurses, physicians, and paramedics is prepared to help people with common health problems, ranging from minor cases to life-threatening disturbances. Medical care at large events, called *Mass Gathering Medical Care* by the National Association of Emergency Medical Services Physicians, is quantified by the number of attendees, expressed in the medical usage rate (MUR).<sup>7</sup> The MUR can be used as a guideline for the required need for care. Since 1996, medical incidents treated at the first aid station of several house parties in the Netherlands have been registered to determine MUR. In this study, the MUR includes consultations of physicians, nurses, and paramedics. The purpose of this study is to report on a nine-year experience of medical support during house parties with approximately three million visitors and 25,000 self-referring patients. Due to the legislation in the Netherlands, unique data can be presented.

Category	Definition	Questionnaire Items
Medical	General medical complaints or health disturbances	General unwell-being/fainting, nausea, vomiting, dizziness, altered consciousness, palpitations, altered body temperature, stomach ache, hyperventilation, dyspnea, cramps
Trauma	Local injuries	Wound/laceration, burn, blister/skin injury, contusion, distortion, fracture, tooth injury, insect bite or stitch, nail problem, foreign body, local inflammation
Psychological	Psychological or psychiatric symptoms	Anxiety, disorientation, psychotic delusion
Miscellaneous	A combination of medical, trauma and/or psychological, or not fitting in other categories	

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Table 1—Categorized health problems

- 1 = *Severe*—Immediate life threatened by airway obstruction, breathing and/or circulation disturbances  
 2 = *Moderate*—Life danger after some hours caused by airway obstruction, breathing and/or circulation disturbances or chances of severe infection or disabilities if not treated within 6 hours  
 3 = *Mild*—No threat of airway obstruction, breathing and/or circulation disturbances, severe infections or disabilities

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Table 2—Severity Index

## Methods

### *Design and Participants*

A prospective, observational study of self-referred patients who reported to an available healthcare station during Dutch raves was conducted. All of those who sought medical care were registered.

Two different registration systems were used. These systems were developed after a prospective pilot study in 1996 that included 1,500 attendees seeking assistance at first aid stations during raves. Some attended the stations just to ask for an analgesic for a headache or to obtain a bandage. Others sought help or advice regarding medical complaints, illnesses, or injuries.

A “headache list” was developed for those asking painkillers for a headache. On this small list, only the time and gender were noted. For the second group, those seeking medical attention, a standard registration questionnaire was developed to gather data on the reported health problems. A list of health disturbances was pre-coded (Table 1). For every patient, the times of arrival and departure at the first aid station, gender, and age were added. Additionally, information about whether the problem existed before the event and the number of visits to the on-scene medical services for the same complaint was noted. Furthermore, information was collected on the type and number of drugs that were used as well as contributory health complaints. Patients were asked about their fluid intake during the last three days, food intake during the last 24 hours, and sleep and rest pattern during the past week. A fluid intake <2,000 ml/day, a food intake of less than three meals per day, and <6 hours sleep per 24 hours were labeled as self-care deficits. Finally, referrals to a general practitioner, dentist, or hospital were registered. All cases were scored on a two-dimensional level. Incidents were categorized as medical,

trauma, psychological, or miscellaneous. Next to these categories each incident was qualified as mild, moderate, or severe (Table 2), based on the Severity Index.<sup>8</sup>

Qualified nurses and physicians examined patients with specific training on party-related risks, including the effects of recreational drugs. They also were trained in using the questionnaire and participated in an introductory course and a yearly refresher and update course. A colleague, who was appointed especially to support the staff in completing the questionnaires, coached all staff members. Mistakes and inconsistencies were corrected on-scene.

### *Procedure*

After entering the first aid station, the patient was received by a front desk officer, who asked the patient about his/her complaint, injury, or question. Some visitors attended the first aid station for self-treatment; they asked for a bandage to avoid blisters or for a painkiller to relieve their headache and were not assessed medically. If the patient suffered from a headache, he or she was added to the headache list. All other patients were transferred to a member of the medical staff, who assessed the health problems. All data were registered in the standard questionnaire.

After discharge from the first aid station or transfer to ambulance personnel for transport to a hospital, a staff member who was especially assigned to verify the registration checked all data on the questionnaire. This official also qualified the incident as mild, moderate, or severe, and categorized it as medical, trauma, psychological, or miscellaneous. All data were collected in a Statistical Package for the Social Sciences (SPSS) file [SPSS Inc, Chicago, IL].

Data of the number of visitors were obtained from the organizers of the events by counting the number of tickets sold.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Parties	22	12	15	14	29	26	35	33	33	219
Visitors	119,750	144,500	216,250	226,500	420,500	466,000	476,750	453,500	455,750	2,979,500
Incidents	2,044	1,566	1,683	1,843	3,629	2,971	3,337	3,818	2,690	23,581
MUR	170	108	78	81	86	64	70	84	59	79

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Table 3—Review of raves

n = 23,581	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Average age (years) ±SD	18.7 ±2.8	20.0 ±4.2	21.0 ±4.5	22.2 ±5.1	21.7 ±4.8	22.2 ±5.1	22.5 ±5.2	23.5 ±5.8	23.3 ±5.7	22.0 ±5.2
Range	13–41	14–50	14–61	14–56	13–63	14–56	14–54	13–59	13–54	13–63
Male	1,268 (62.0%)	821 (52.4%)	947 (56.3%)	976 (53.0%)	1,824 (50.3%)	1,563 (52.6%)	1,728 (51.8%)	2,037 (53.4%)	1,349 (50.1%)	12,513 (53.1%)
Female	765 (37.4%)	727 (46.4%)	727 (43.2%)	860 (46.7%)	1,782 (49.1%)	1,404 (47.3%)	1,599 (46.3%)	1,768 (46.3%)	1,313 (48.8%)	10,945 (46.4%)

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Table 4—Demographics

Note: in some cases gender was not mentioned in the case record form.

*Statistics*

Group differences were evaluated using Pearson's chi-square test. A probability of <0.05 was considered statistically significant. Descriptive statistics were used where appropriate.

Medical usage was reported as MUR as defined by the National Association of Emergency Medical Services Physicians, expressed as patients per 10,000 (PPTT) participants.<sup>7</sup> This is calculated by dividing the number of individuals seeking medical care by the total attendance for that event multiplied by 10,000.

**Results**

A summary of all raves included in the study is in Table 3. Data from 219 raves totaling approximately 3 million visitors were collected. A total of 23,581 patients visited the first aid stations. This included 5.9% (1,383) returning patients. The MUR of the first aid stations varied from 59–108 patients PTTT visitors from 1998 to 2005. In 1997, the MUR was 170.

*Demographics (Table 4)*

The mean age of first aid station attendees gradually increased from 18.7 ±2.7 to 23.3 ±5.7 from 1996 to 2005 (*p* <0.05). More men than women visited the first aid stations.

*First Aid (Tables 5 and 6; Figure 2)*

Patients stayed at the first aid station an average of 18 ±46 minutes (range 1–390 minutes); this remained relatively stable over the years. During the first years of observation, the "Medical" category scored highest (49.1–59.4%). Beginning in 2002, the number of patients in the "Trauma"

category increased from 30.2 to 49.8–57.2%, while the number in the "Medical" category decreased from 59.1 to 36.0–43.0%. After 1999, a drop in the numbers of those in the "Psychological" category was observed (from 2.3%–2.6% to 1.2–1.9%). Most health problems were classified as mild (97.1%). This was stable throughout the years (96.0–98.6%), whereas moderate health problems were found in only 1.9% (457) of all cases. Fifteen cases of severe incidents were observed during the nine years (0.1% of all cases). They were qualified as medical nine times. Hyperthermia, circulatory insufficiency and respiratory insufficiency each occurred three times. Two trauma incidents were seen (penetrating abdominal trauma; brain injury). The most frequently found clinical syndrome in these severe incidents was excited delirium.

The number of reported deaths was one (respiratory failure). It was included in the 15 severe incidents.

Of all of the first aid station attendees, 220 persons had no complaints or injuries.

*Clinical Features (Table 7)*

Most reported health problems were minor complaints such as general unwell-being and fainting (21.2%), nausea (11.6%), and/or dizziness (8.9%). Vomiting also was observed frequently (6.0%). Four percent of the cases were states of altered consciousness. Two to three percent of the cases were abdominal pain, hyperventilation, cramps, gastric pain, and/or shortness of breath. In 1–2%, palpitations and low body temperature were present. High body temperature was present in 0.3% of all cases. Statistically significant differences (*p* <0.05) in medical symptoms were found between male and female patients. General unwell-being

n = 23,851	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Average stay (minutes) ±SD	22.5 ±61.5	17.1 ±25.0	20.2 ±56.2	18.1 ±56.2	15.8 ±56.2	17.8 ±43.0	18.6 ±37.1	17.2 ±34.5	18.8 ±40.3	18.1 ±46.3

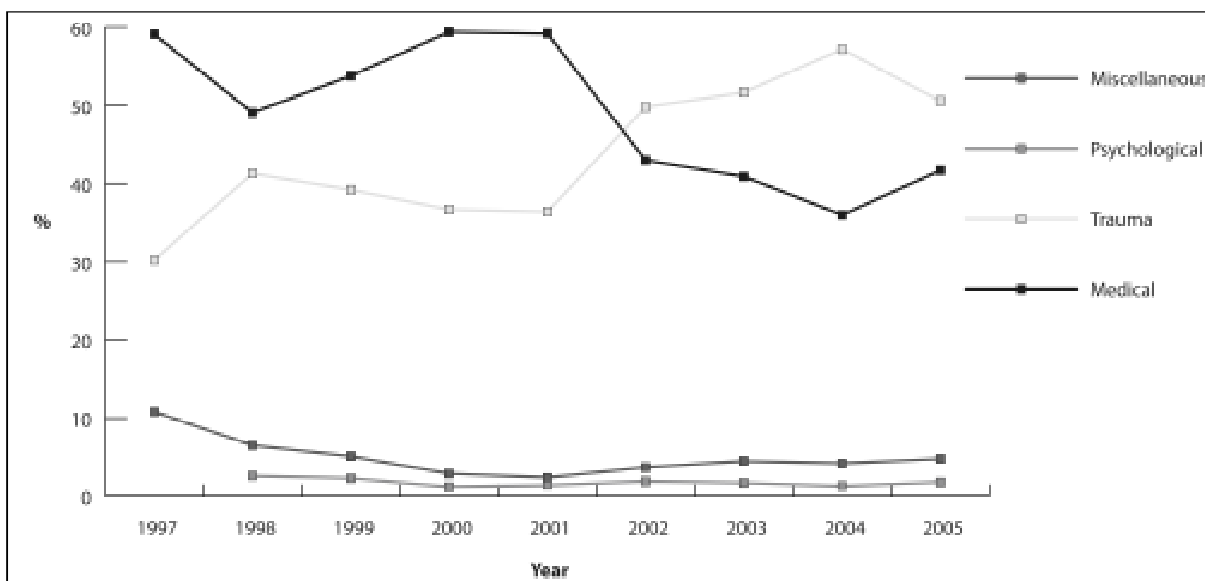
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Table 5—Stay at the first aid station

n = 23,851	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
3—Mild	(96.8)	(97.0)	(98.3)	(98.6)	(96.0)	(96.8)	(96.0)	(96.4)	(96.6)	(97.1)
2—Moderate	(2.7)	(2.4)	(1.5)	(1.2)	(1.1)	(1.5)	(2.4)	(2.0)	(2.2)	(1.9)
1—Severe	(0.0)	(0.1)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)
Reported	1	1	2	1	1	4	3	0	2	15
Deaths	0	0	0	0	0	0	1	0	0	1

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Table 6—Health qualifications and reported deaths. Percentage, and where appropriate numbers are given.



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Figure 2—Health categories

Note: The Psychological category was initiated in 1998; until that year the category was included in Miscellaneous

and fainting, nausea, dizziness, abdominal ache, dyspnea, and hyperventilation occurred more frequently in women than in men, while altered consciousness, cramps, gastric ache, palpitations and high and low body temperature were found more frequently in men. In the younger group (age <22 years), all medical variables were found significantly more frequently, except altered consciousness, and low body temperature. Contusions and distortions (15.2%), wound/lac-

eration (11.5%), and other skin injuries (9.4%) were the most frequently seen injuries. Wounds/lacerations, fractured bones/dislocations, and foreign bodies were more common in more men than women, whereas skin injuries, burns, and nail problems were more frequent in women. Wounds/lacerations, skin injuries, insect bites, fractured bones/dislocations, teeth injuries, and foreign bodies were significantly more frequent in attendees >21 years of age.

Descriptive Variables	All	Male	Female	p	Age <22 years	Age >21 years	p
More than one complaint is possible	23,581	53.1	46.4		55.6	38.3	
Medical	11,196	48.5	51.0	0.000			
General unwell being and fainting	4,989 (21.2)	20.3	22.1	0.004	24.1	16.9	0.000
Nausea	2,739 (11.6)	10.0	13.5	0.000	13.9	8.4	0.000
Dizziness	2,091 (8.9)	7.1	10.9	0.000	10.5	6.6	0.000
Vomiting	1,423 (6.0)	5.8	6.3	0.180	6.5	5.4	0.747
Altered consciousness (EMV <15)	938 (4.0)	4.7	3.1	0.000	3.2	4.6	0.000
Abdominal ache	653 (2.8)	1.8	3.9	0.000	3.5	1.8	0.000
Hyperventilation	584 (2.5)	1.5	3.5	0.000	3.0	1.8	0.004
Cramps	570 (2.4)	3.1	1.7	0.000	3.0	1.3	0.000
Gastric ache	564 (2.4)	2.7	2.1	0.002	2.8	1.9	0.048
Dyspnea	558 (2.4)	2.1	2.7	0.000	2.7	2.0	0.484
Palpitations	303 (1.3)	1.5	1.0	0.000	1.5	1.0	0.126
Low body temperature (<36.5°C)	265 (1.1)	1.5	0.7	0.000	0.7	1.7	0.000
High temperature (>37.5°C)	78 (0.3)	0.4	0.2	0.008	0.4	0.3	0.472
Injury	10,617	46.3	43.2	0.000			
Contusion/distortion	3,579 (15.2)	14.9	15.5	0.212	15.7	14.9	0.093
Wound/laceration	2,711 (11.5)	17.1	5.2	0.000	10.4	13.2	0.000
Blister or other skin injury	2,224 (9.4)	6.5	12.8	0.000	7.3	12.7	0.000
Insect stitch or bite	501 (2.1)	2.1	2.2	0.458	1.4	3.4	0.000
Eye injury	369 (1.6)	1.7	1.4	0.108	1.6	1.6	0.872
Fractured bone/dislocation	298 (1.3)	1.5	1.0	0.000	1.0	1.7	0.000
Burn wound	265 (1.1)	0.9	1.3	0.005	1.1	1.1	0.910
Tooth injury	167 (0.7)	0.8	0.6	0.089	0.6	1.6	0.003
Nail problem	152 (0.6)	0.5	0.8	0.001	0.6	0.7	0.186
Foreign body	121 (0.5)	0.8	0.4	0.000	0.5	1.0	0.000
Local inflammation	121 (0.5)	0.5	0.5	0.778	0.5	0.6	0.240
Psychological	359	61.1	38.6	0.000			
Anxiety	683 (2.9)	3.0	2.8	0.525	3.4	2.1	0.022
Disorientation	257 (1.1)	1.3	0.4	0.000	0.8	1.3	0.065
Delusion	208 (0.9)	1.7	0.4	0.000	1.0	0.6	0.000
Combination medical, trauma, and/or psychological	1,086	64.1	35.5	0.000			
No health disturbance	220						

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**Table 7**—Descriptive analysis of clinical features

In the “Psychological” category, anxiety was the most frequent symptom (2.9%). Disorientation and delusions were more frequent in men than in women. Anxiety and delusions were significantly more frequent in younger attendees (<22 years of age). Eighty patients with seizures were reported (0.3%), 158 cases of pain (0.7%), and 67 cases of diarrhea (0.3%).

#### Headache (Table 8)

Headache was scored separately at every rave. Of the 23,581 registered patients, nearly 8,000 rave visitors went to the first aid station for a painkiller for a headache. If added to the data on the questionnaire, the number in the “Medical” category would have been increased, as well as the MUR.

#### Self-Care Deficits

Of all of the patients, 6.0% (1,416) stated that they had had a decreased food intake, 3.6% (859) a decreased fluid intake, and 3.6% (855) indicated that they suffered from decreased sleep and rest.

#### Incidents Related to Recreational Drugs

Of the 23,581 registered patients (of the approximately three million rave visitors), 37.6% (8,863) of the health problems could be related to recreational drugs. Ecstasy was the most common drug involved (21.8%), followed by alcohol (16.1%), amphetamine (4.2%), cannabis (3.0%), GHB (2.6%), and cocaine (1.1%). It is of note that the first incidents of GHB use were in 2000.

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Persons requesting analgesics	81	100	215	445	371	1,361	2,101	1,771	1,376
Rave visitors	119,750	144,500	216,250	226,500	420,500	466,000	476,750	453,500	455,750
Percentage	0.1	0.1	0.1	0.2	0.1	0.3	0.4	0.4	0.3

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**Table 8**—Number of persons attending first aid stations asking for a painkiller as self-treatment to headache.

#### Existing Problems

Medical personnel had to cope with incidents that started before the party as well. An average of 14.6% (3,440) of the persons asked for help with problems that presented before their arrival at the party.

#### Clinical Referrals

Of all patients, 1.9% (450) were referred to their family doctor, 1.4% (334) to the emergency department by self-transport, and 0.9% (210) by ambulance; 0.1% (29) were referred to a dentist.

#### Discussion

In contrast to the overall assumption, short-term health risks are low at rave parties. Only 15 cases of severe health problems and one death were observed during these raves. Main presented issues included excited delirium, hyperthermia, and circulatory and respiratory insufficiency. Nearly all of these severe incidents were related to recreational drug intake, but this number is low. More than 97% of the complaints were classified as mild. The data presented are unique. In no other country are legal rave parties organized on this scale. The data also allow a realistic estimation of the MUR during such raves, which is 59–108 PTTT visitors, although headache was not included. In the first year of the study, a MUR of 170 was found. This number can be explained by the fact that raves were a new phenomenon in the Netherlands. Many of the young attendees were inexperienced in using recreational drugs like ecstasy and amphetamines. Anxiety was more frequent among younger people. Harm Reduction Health Education was a new program at that time.

The MUR at raves is similar to that for other mass gatherings and not excessive. In a retrospective review of 405 single-day concerts in California in 1998, the MUR for rock concerts (137), non-rock concerts (71), and a punk festival (71) were reported.<sup>9</sup> During three outdoor stadium concerts in the US in 1999, the MUR was 83.10 Other mass gatherings also were surveyed, and the following rates were found: papal mass in Denver in 1995 (MUR = 4),<sup>11</sup> papal mass in New York in 1995 (MUR = 19),<sup>12</sup> a cross-country ski marathon in 1984 (MUR = 441),<sup>13</sup> Calgary Winter Olympics in 1988 (MUR = 19),<sup>14</sup> college football 1995 (MUR = 11),<sup>15</sup> and Los Angeles Summer Olympics in 1984 (MUR = 16).<sup>16</sup> However, it is difficult to compare MURs. First, MUR has not been defined clearly. For instance, some studies include headaches, while others do not register these complaints, because they are considered self-treatment. Second, sometimes the MUR is restricted to

care by physicians. In the current study, reports from nurses and paramedics also are included. Cultural differences of people visiting the on-scene first aid stations may cause variations in MUR as well, so MURs can differ in different countries.

Through the years, the number of patients classified in the “Medical” category dropped, while the number in the “Trauma” category increased. This can be explained by multiple factors. It is possible that the number of outdoor rave parties has grown. During outdoor raves, more patients present with minor traumatic incidents, such as blisters and distortions. Improved education on prevention of health risks among youth, for example, information about recreational drugs, harm reduction programs, and preventive interventions by rave organizers, such as free water distribution, crowd management, quality improvement of security personnel, and climate control probably have led to decreased numbers of medical incidents.

Questions remain as to whether the relatively low rate of severe incidents is related to the open and legal circumstances under which raves occur in the Netherlands. To the knowledge of the authors, no data on large rave parties are available from other countries. Perhaps the data on health risks during rave parties compare favorably to data on spectators at football matches, although no prospectively collected data are available, and this assumption is based on the lay press. Based on the data, no reasons exist to prohibit rave parties because of direct or potential harm of health. However, other reasons may be considered more important such as political or principal arguments, or simply the prohibition of drugs commonly used during raves. Additionally, the contribution of the first aid stations in the prevention of health-related problems during rave parties cannot be estimated. Furthermore, long-term effects of rave parties on health or drug use were not investigated, nor research on possible hearing problems caused by loud music was performed. Other limitations of the study include that although the sample is large, it only included self-referrers. It is possible that a number of persons suffered from complaints, but did not visit the first aid station. Wijngaart *et al* and Bruin *et al* found some party visitors sought help with friends, security personnel, or catering staff.<sup>17,18</sup> Furthermore, some ill visitors may have gone directly to their general practitioner or a (nearby) hospital emergency room, instead of attending the on-scene first aid station. No data on this were included.

#### Conclusions

In conclusion, evidence is provided that a very low number of health-related problems occur during legal rave parties in the Netherlands.

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