Chapter Nine

Summary of the main findings
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In this dissertation, findings were focused on two themes - prospective studies on health disturbances during rave parties in the Netherlands in general and recreational drug-related incidents specifically. Next to these, rave parties were researched to map medical care at large-scaled public events. The general aim of these studies were fourfold:

- How many visitors attend the first aid station on scene at raves, what is the average number of first aid attendees per 10,000 party visitors, how long do patients stay on a first aid station and what types of incidents can be identified?
- What is the prevalence of visitors of first aid stations at raves with substance-related health problems? And what kind of drugs are involved?
- Which substance-related incidents are reported, what is the frequency and severity?
- What are the requirements for medical support at raves?

In this chapter, the main results are summarized. Finally, the limitations of the studies are reviewed.

The first aforementioned research questions are addressed in Chapter 1. In the general introduction the setting of the research was defined. All findings of the study were found at rave parties, also known as house – or dance parties. “Dance” is a collective name for all types of electronic dance music (EDM). The main feature is that the music is performed with electronic instruments and is DJ-directed. “house” in the Netherlands was a collective name for dance music. This led to confusion, since “house” is also the name of a subgenre. Therefore, “dance” (or EDM) is now the most common over-all term. In other countries, “techno” and “progressive” are used as collective names. Large dance events are worldly wide known as “raves” with a range of 1000-60,000 visitors. These events are also known as “Mass Gatherings”, and defined as “Any gathering of a large number of people attending an event that is focused at specific sites for a finite time with a potential for a delayed response to emergencies”.

In The Netherlands, rave parties attract up to 60,000 visitors. Approximately 650,000 youngsters (15-35 year old) attend these events yearly. Since the nineties of the last
century, the number of raves and the diversity of these events are booming. Different studies confirmed, after extensive research, that youngsters are using alcohol and/or drugs during nightlife. Ecstasy, because of its energizing and euphoric effects, is very popular, next to alcohol, cannabis, amphetamine and cocaine. At the late 90’s Gamma-Hydroxybutyrate (GHB) was introduced. Nowadays, specific nightlife segments have specific substance profiles:
- Alcohol: the highest among mainstream (mixture of different music styles) and dance,
- Cannabis: the highest in the alternative scenes,
- Cocaine, amphetamine and GHB: higher in dance than in all other scenes,
- Ecstasy: much higher in dance than in other scenes.
These substances are reviewed in the next chapter.

Chapter 2 focuses on most-used recreational drugs. National prevalence surveys on drug use were carried out in the Netherlands since 1997 among the general 15-64 years old population. In 2009, from a representative sample (N=5,769), 92% of all respondents reported a lifetime prevalence of alcohol. This was 25.7% for cannabis, 6.2% for ecstasy, 5.2% for cocaine, 3.1% for amphetamine and 1.3% for GHB.
Main reason for drinking alcohol is to feel pleasure and relaxation, and become talkative and socially outgoing and to fulfill social expectations. People like to increase their self-confidence and get some degree of intoxication, as well. People take MDMA pills, because it induces euphoria and it enhances a sense of intimacy with others. Next to that it is used because of it energetic effects and to enhance activities, like listening to music. Amphetamine is snuffed or taken as pills mainly to keep going and to stay awake, while cannabis is smoked to relax and get “stoned”. Cocaine is snorted to get a fast kick, to keep going and stay awake. Finally, people use GHB to relax and to get “high” and because it enhances a sense of sexuality.
Of all six most-used recreational drugs, name, social aspects, physiological effects, chemistry, epidemiology and pharmacokinetics are reviewed.

Chapter 3 reported on a 9-years experience of medical support during house parties (raves) in the Netherlands. In a prospective observational study of self-referred patients from 1997 till 2005 in a setting of first aid stations with specifically trained medical
and paramedical staff during raves, self referred patients were diagnosed, helped and recorded in a standardised way.

During 219 raves with approximately 3 million visitors during a 9-year period, 23,581 patients visited the first aid stations. Medical usage rate (MUR) varied from 59-170 patients per 10,000 rave participants. The mean age increased from 1997 till 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. These unique data from the Netherlands demonstrate a very low number of serious health related short-term problems during raves. Specific substance-related health disturbances are inventoried in the next chapter.

Chapter 4 describes a 12-year (1997-2008) observation of substance-related incidents occurring at rave parties in the Netherlands, including length of visits to first-aid stations, substances used, and severity of the incidents. During rave parties, specifically trained medical and paramedical personnel staffed first aid stations. Visitors were diagnosed and treated, and their data were recorded using standardized methods. During the 12-year period with 249 rave parties involving about 3,800,000 visitors, 27,897 people visited a first aid station, of whom 10,100 reported having a substance-related problem. The mean age of these people was 22.3 ± 5.4 years; 52.4% of them were male. Most (66.7%) substance-related problems were associated with ecstasy or alcohol use or both. Among 10,100 substance-related cases, 515 required professional medical care, and 16 of these cases were life threatening. People with a substance-related problem stayed 20 min at the first aid station, which was significantly longer than the 5 min that those without a substance-related health problem stayed. These data from the Netherlands identify a variety of acute health problems related to the use of alcohol, amphetamines, cannabis, cocaine, ecstasy, and GHB. Although most problems were minor, people using GHB more often required professional medical care those using the other substances. In the next chapter GHB-related incidents are researched specifically.

Adherence to harm and risk reduction policy, and the use of first aid stations with specially trained staff for both minor and serious incidents is recommended.

Chapter 5 was to determine the health disturbances and to assess the severity of the incidents as reported on a nine years experience of GHB-related First Aid Attendees
attending First Aid Stations at rave parties. This prospective observational study concerned self-referred patients at First Aid Stations during rave parties from 2000 to 2008. Patients were diagnosed, treated by specifically trained medical and paramedical personnel and data were recorded using standardized methods.

During the nine-year period with 202 rave parties, involving approximately three million visitors, 22,604 First Aid Attendees visited the First Aid Stations, of which 771 reported GHB-related health problems. The mean age of the GHB-using First Aid Attendees was 25.7 ± 6.1 years, most of them (66.4%) were male. Approximately one-third (32.7%) used one substance, while 48.1% combined GHB with ecstasy, alcohol or cannabis. One out of five (19.2%) combined GHB with other substances or more than one substance. One case was categorized as severe/life-threatening and 202 (26.2%) cases as moderate, requiring further medical care. Totally, 43 (5.6%) First Aid Attendees needed hospital care. Most encountered health disturbance was altered consciousness. Combinations of altered consciousness, vomiting and/or low body temperature were found in 186 cases (24.1%) and considered to be potentially dangerous. GHB-related First Aid Attendees required a longer stay at the First Aid Stations than the total group First Aid Attendees did (median 45 minutes versus 10 minutes).

First Aid Attendees demonstrate a variety of short-term health disturbances related to the use of GHB. Although most problems were mild, professional medical care was required for a quarter of GHB-using First Aid Attendees.

Chapter 6 describes the research to develop comprehensive guidelines for medical care during mass gatherings based on the experience of providing medical support during rave parties.

It was a prospective, observational study of self-referred patients who reported to First Aid Stations (FASs) during Dutch rave parties. All users of medical care were registered on an existing standard questionnaire. Health problems were categorized as medical, trauma, psychological or miscellaneous. Severity was assessed based on the Emergency Severity Index. Qualified nurses, paramedics and doctors conducted the study after training in the use of the study questionnaire. Total number of visitors was reported by the organisor of the event.

During the 2006-2010-study period, 7,089 persons presented to First Aid Stations for medical aid during rave parties. Most of the problems (91.1%) were categorized as
medical or trauma, and classified as mild. The most common medical complaints were general unwell-being, nausea, dizziness and vomiting. Contusions, strains and sprains, wounds, lacerations and blisters were the most common traumas. A small portion (2.4%) of the emergency aid was classified as moderate (professional medical care required) or severe, including two cases (0.03%) that were considered life threatening. Hospital admission occurred in 2.2% of the patients. Fewer than half of all patients presenting for aid were transported by ambulance. More than a quarter of all cases (27.4%) were related to recreational drugs.

During the five-year field research period at rave dance parties, most presentations on-site for medical evaluation were for mild conditions. A medical team of six healthcare workers for every 10,000 rave party visitors is recommended. On-site medical staff should consist primarily of first aid providers, along with nurses who have event-specific training on advanced life support, event-specific injuries and incidents, health education related to self-care deficits, interventions for psychological distress, infection control and disaster medicine. Protocols should be available for treating common injuries and other minor medical problems, and for registration, triage, environmental surveillance and catastrophe management and response.

In Chapter 7, medical aspects of raves are discussed and directions for the future are given. As general findings the following facts were found:

Overall, investigating hundreds of rave parties with over four million visitors and more than 30,000 First Aid Attendees, we found at the time of this report that

- An average of a Medical Usage Rate (MUR) of 70, which means that for every 10,000 visitors, 70 people will attend to a First Aid Station (FAS) with a health complaint that need medical intervention. Next to this 70, about 25 persons on every 10,000 ask for self-treatment (painkiller for headache, hear-protection devices, sanitary napkins for women, a band-aid for small wounds and blisters, etc.).

- Median stay at the FAS is 10 minutes. If the medical problem is substance-related, the stay is prolonged to a mean of 20 minutes. And if the stay is GHB-related it is 45 minutes.

- Approximately 2% of all First Aid Attendees suffer from a health disturbance, which needs professional medical care (doctor (MD), nurse (RN) or physiotherapist). This is 0.01% of all party visitors. Half of them are transferred to a hospital. A total of 0.05%
of all First Aid Attendees are in a life-threatening situation, which means one life-threatening case on approximately every 200,000 rave visitors.

• Of all registered First Aid Attendees 36% have a substance-related problem. In 64% of these cases drugs are single used and in 25% a combination of two drugs (of which one of them usually is alcohol) is present; the rest of the cases is a combination of more than two substances. In case of health-disturbance related to substances single-used ecstasy (33% and decreasing through the years), alcohol (23% and increasing), 3% amphetamine, 3% GHB, 2% cannabis and less than 1% cocaine, are involved.

During the research period recreational drug-use changed. Monitoring of the Dutch drug market started; lifetime prevalence (LTP) of ecstasy and amphetamine increased. And while the use of alcohol in the mid nineties of the last century was not fashionable, the use of alcohol increased heavily at parties during the research period. Meanwhile, GHB was introduced in nightlife.

Youngsters who used substances got acquainted with the effects and were educated how to avoid problems. Organizers of events became aware of taking preventive measurements, like climate control and offering free drinking water. Dutch policy was based on promoting health and reduction of incidents rather than on suppression of drug use.

Serious single-use substance-related incidents that need professional medical care are rare during the research period. Risks of serious incidents (with substance use compared to without use) differ from 1-2 more risky for cannabis, ecstasy or alcohol, to 2-6 for amphetamine, to 1-13 for cocaine, to 17-27 for GHB.

Combinations of substances have higher risk scores. This applies especially to alcohol and GHB. This combination is 26-28 more risky than the risk when no substance is used. Using ecstasy as well as GHB is 25-30 more risky compared to no use. It appears that GHB is most dangerous.

Specific serious drug-related problems were unconsciousness, airway at risk (by vomiting) and respiratory insufficiency with depressants (alcohol and GHB) and threatened airway (by trismus), seizure, excited delirium, hyperthermia and circulatory insufficiency with stimulants (ecstasy, amphetamine and cocaine).
From 1997-2008 a total of 31 patients with substance-related problems needed professional medical care in a population of 3,800,000 party visitors. These figures remained constant in 2009 and 2010. In 2011, 26 cases were reported in one single year. This is reported in Chapter 8.

From the period the research started medical care at events became more professional and nurses were employed next to or instead of first aid providers, added by physicians. The level of care was upgraded from basic first aid to specialized care and advanced life support. Medical care providers were trained on event-specific risks. Mass gathering medicine guidelines were developed for events. Event health care was more integrated in overall safety plans and non-medical service members, such as security personnel, were trained in recognizing serious health threads and communication with medical teams.

Specific educational programs for substance-related first aid and professional care were developed for nightlife workers, security personnel, police officers, first aid providers and emergency care professionals.

**Limitations of the research**

There were limitations of the current study that should be acknowledged. For example, long-term effects on substance use or drug addiction were not addressed. This study was conducted in the Netherlands and may not be valid for other countries. In addition, the study was limited to data obtained at rave parties. Although the study sample was large, it included only self-referrals, which might not be representative of all health-related incidents at rave parties. It is possible that many people who experienced negative effects did not present themselves at a first aid station.

No biological confirmation of the substance-intake by toxic screening of urine or blood was done. It is not measured to what the attendees were exposed to, quantitatively or qualitatively. It’s only known what they voluntarily reported. Substance use at rave parties might be underreported and hence underestimated because stigmatization or a fear of legal involvement. For reasons such as these, some visitors with health complaints may have gone directly to their family physician or a hospital emergency room, rather than visiting an on-the-scene first aid station.