

Deaths from cardiac arrest are misclassified, overestimated

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Forty percent of deaths attributed to cardiac arrest are not sudden or unexpected, and nearly half of the remainder are not arrhythmic—the only situation in which CPR and defibrillators are effective—according to an analysis by researchers at UC San Francisco and the City and County of San Francisco Office of the Chief Medical Examiner.

In a three-year study of 20,440 deaths in San Francisco, the researchers identified 912 cases in which the individual died of an apparent out-of-hospital [cardiac arrest](#) (OHCA), and conducted autopsies and lab tests on 896 (98 percent) of those. They found that only 541 individuals—or 59 percent—actually met the criteria set by the World Health Organization (WHO) for sudden cardiac death (SCD).

Of those SCDs, 13.5 percent, or almost 1 in 7, were due to a hidden overdose, with lethal opioid levels in 61 percent of the cases, a reflection of the ongoing opioid epidemic.

The findings call into question the accuracy of aggregate mortality data, clinical trials and research studies, as well as the death certificates and emergency medical system (EMS) records on which those datasets are based. The analysis also showed substantial race and sex differences in SCD epidemiology, reinforcing the importance of investigating these deaths in women and diverse populations.

"Our findings demonstrate the poor accuracy of our current, widely adopted definitions for [sudden cardiac death](#), which essentially are a presumption of cardiac cause," said lead author Zian H. Tseng, MD, MAS, UCSF Health cardiac electrophysiologist. "Restricting all such deaths to autopsy-confirmed cardiac causes, we found a lower prevalence of coronary disease and an increasing prevalence of causes not involving reduced blood flow to the heart."

The study appears in the June 19, 2018, special autopsy issue of the American Heart Association journal *Circulation*.

The WHO defines sudden deaths as nonviolent and otherwise unexplained deaths occurring less than 24 hours from the onset of symptoms. In everyday practice, the category also includes the reported impression of an EMS responder of OHCA. These variable definitions

result in widely varying estimates of the annual incidence of SCDs, from 184,000-450,000 in the United States.

As more than 90 percent of these deaths occur outside the hospital and non-forensic autopsies are rarely performed, causes of death are almost always presumed.

In the POstmortem Systematic invesTigation of Sudden Cardiac Death (POST SCD) study, Tseng and his colleagues reviewed all deaths in San Francisco County between February 2011 and March 2014, and conducted autopsy, toxicology and histology tests, as well as record reviews, on patients who had been reported to have died in OHCA. A multidisciplinary committee of the assistant medical examiner, cardiac pathologist, neurologist and two cardiologists/cardiac electrophysiologists adjudicated the final cause of death.

Of the 912 identified OHCA deaths, 40 percent did not meet the WHO criteria for [sudden death](#). Of the 525 cases that met the criteria and were autopsied, only 55.8 percent were found to be sudden arrhythmic deaths (SADs).

"Because SADs are the only type of sudden deaths rescued by defibrillators and the intended focus of clinical trials, risk studies and molecular studies of SCD, it is essential to distinguish SAD from non-arrhythmic causes," said Tseng, the Murray Davis Endowed Professor in the Cardiology Division and Cardiac Electrophysiology Service at UCSF.

The rates of WHO-defined sudden death were highest in blacks and lowest in Hispanics. However, autopsies showed that arrhythmic deaths in these populations were significantly lower than for whites, and much lower in women (45 percent) than men (61 percent).

The leading causes of death in the 525 autopsies were coronary disease (32 percent), overdose (13.5 percent), cardiomyopathy (10 percent), cardiac hypertrophy (8 percent) and neurologic (5.5 percent). Since all of these misclassified deaths were designated by EMS as cardiac arrest, overdoses and other metabolic emergencies may be under-recognized as causes of death, the authors said.

"Our methods may provide an outline for medical examiner or coroner protocols for the systematic examination of these out-of-hospital natural deaths, which are rarely investigated in the community," said senior author Ellen Moffatt, MD, assistant medical examiner in the Office of the Chief Examiner.

While this was the most comprehensive study of SCD to date, the authors cautioned that exact causes of [death](#) sometimes remain unclear and subject to interpretation.

Provided by University of California, San Francisco

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