

What are the health effects (benefits and risks) of steam baths (Saunas)?

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This rapid response was prepared by the Uganda country node of the Regional East African Community Health (REACH) Policy Initiative.

Key messages

No studies were found done in the African population to assess the effects of steam bathing. There is need for these.

- Steam bathing is usually a social affair in many societies and is generally safe when used in moderation in all ages, although some responses will be modified according to how accustomed one is to it
- It may be of benefit in decongesting respiratory systems, relieving chronic inflammatory pains like those of rheumatism, skin problems like acne
- Steam bathing is generally safe for the healthy cardiovascular system and may also be considered safe and without undue risk of cardiac complications even for cardiovascular patients, as long as it is used in moderation
- It has no effect on pregnancy and fertility. Its effects on weight loss are not significant
- It has minor and transient effects on drugs and hormones



Who requested this rapid response?

This document was prepared in response to a specific question from a policy maker in Uganda.

! This rapid response includes:

- **Key findings** from research
- **Considerations about the relevance** of this research for health system decisions in Uganda

X Not included:

- Recommendations
- Detailed descriptions

What is SURE Rapid Response?

SURE Rapid Responses address the needs of policymakers and managers for research evidence that has been appraised and contextualised in a matter of hours or days, if it is going to be of value to them. The Responses address questions about arrangements for organising, financing and governing health systems, and strategies for implementing changes.

What is SURE?

SURE – Supporting the Use of Research Evidence (SURE) for policy in African health systems - is a collaborative project that builds on and supports the Evidence-Informed Policy Network (**EVIPNet**) in Africa and the Regional East African Community Health (**REACH**) Policy Initiative (see back page). SURE is funded by the European Commission's 7th Framework Programme.

www.evipnet.org/sure

Glossary

of terms used in this report:

www.evipnet.org/sure/rr/glossary

Background

Sauna, steam bath or Finnish bath are some of the common terms used to describe a small room or house designed as a place to experience dry or wet heat sessions. Saunas can be divided into two basic styles: conventional saunas that warm the air or infrared saunas that warm objects. Infrared saunas may use various materials in their heating area such as charcoal, active carbon fibers, and other materials. It is usually a social affair in which the participants disrobe and sit or recline in temperatures typically between 70 °C (158 °F) and 100 °C (212 °F), and at a humidity of about 10-15%, which induces relaxation and promotes sweating. These have been adopted all over the world and have become a common phenomenon in Uganda as well. Their safety and effectiveness however have remained a question for health officials. This paper will summarize the evidence on the positive and negative effects of steam baths or saunas as they are commonly referred to.

How this Response was prepared

After clarifying the question being asked, we searched for systematic reviews, local or national evidence from Uganda, and other relevant research. The methods used by the SURE Rapid Response Service to find, select and assess research evidence are described here:

www.evipnet.org/sure/rr/methods

Effects of Steam bathing

No research evidence looking at the effects of steam bathing in the African population was found, and so the findings summarized here have been postulated and adapted for the population in Uganda. In addition, no systematic reviews of the evidence were found in relation to the effects of steam bathing. However several randomized controlled trials and literature reviews have been done to look at the benefits and risks of sauna bathing for healthy adults and children, as well those with identified heart lung and skin conditions and they have been used to provide a summary of the evidence here. The major effects are summarized in Table 1 below.

On the cardiovascular system (blood circulation, blood pressure)

It is common to find a standard warning by manufacturers of steam bath equipment advising those with heart disease or those with abnormal blood pressures to consult their physicians before using the equipment. No systematic review was found that has looked at the effects of sauna bathing and in fact, the literature and views from the medical fraternity that one finds are mixed, saying that these may actually increase or decrease blood pressure and the risk of heart attack (1). However findings from a literature review conducted to look at the benefits and risks of steam bathing are summarized in Table 1 below.

What has been confirmed though is a well known fact that one's heart works harder in the steam bath, heart rates have been shown to increase from the average 72 beats per minute to anywhere between 100-160 beats per minute depending on whether one is an accustomed person or not (1). This is comparable to light physical work like a brisk walk or to moderate degrees of a fever. Blood circulation will increase but not necessarily the blood pressure because external heat will stimulate dilatation of the blood vessel walls, in effect enlarging the vessels and this will accommodate the increased blood flow.

Table 1: Acute physiological¹ effects of Steam bathing

System function or effect	Direction of effect	Magnitude of effect
Heart rate	Increased ↑	Is increased by - up to 100 beats/min during moderate sauna in accustomed subjects - up to 150 beats/min during intense sauna bathing or in unaccustomed subjects
Cardiac output	Increased ↑	Increases from 5-6 L/min up to 9-10 L/min
Cardiac stroke volume		Remains unchanged
Systolic blood pressure		Remains unchanged Or* Decreased by 8-31 mmHg Or * Increased by 9-21 mmHg
Diastolic blood pressure		Remains unchanged Or* Decreased by 6-39 mmHg
Blood flow to internal organs	Decreased ↓	Blood to the kidney is decreased by 0.4 L/min Splanchnic ² blood flow is decreased by 0.6 L/min
Blood flow to muscles	Decreased ↓	Reduces by 0.2 L/min
Skin temperature	Increased ↑	Happens within a few minutes up to 40°C
Skin blood flow	Increased ↑	Increases from 5-10% to 50-70% of cardiac output (that is from 0.5 to 7 L/min)
Sweating	Increased ↑	Sweat is secreted at a rate of 0.6-1.0kg/hr at 80-90°C (Average total secretion is 0.5kg during a typical session)
Rectal temperature	Increased ↑	Increases by 0.2°C at 72°C for 15 minutes Increases by 0.4°C at 92°C for 20 minutes Increases by 1.0°C at 80°C for 30 minutes

Adopted from Hannuksela and Ellahham, 2001

Circulation will increase and as the heat persists, more blood is pumped to the peripheral areas or the surface of the skin, so as to cool down the temperatures. A healthy or normal heart is able to handle these stresses and might even benefit from them as a cardiovascular work-out (2), however the same cannot be said with confidence for an unhealthy one. A research by Ilkka Vuori reveals that steam baths cause significant but usually well tolerated hyperkinaemia[#] and thus increased volume load but not pressure load to the heart (3). In unaccustomed people and convalescent patients, heart rate may increase and blood pressure

¹ Relating to how organs and systems in the body function

² Relating to the gastrointestinal tract

* Findings from different studies

Increased circulation rate

falls excessively causing symptoms. However a randomized controlled trial whose objective was to make a preliminary assessment of the safety and acceptance of supervised sauna bathing at moderate temperatures in people with chronic heart failure, found that sauna bathing under moderate and supervised conditions appeared to be well tolerated and might be safe for people with chronic heart failure (4). Kihara and colleagues have gone further to show that repeated sauna treatment improves ventricular arrhythmias in patients with CHF as these ventricular arrhythmias are an important target in the treatment of chronic heart failure (5).

Masuda and colleagues have also suggested from another trial that repeated sauna therapy may protect against oxidative stress, which leads to the prevention of atherosclerosis (6).

On the lungs

Steam bathing decreases congestion in the lungs and increases the vital capacity, tidal volume, minute ventilation, and forced expiratory volume of the lungs (1). This is beneficial for patients with asthma or chronic bronchitis who report that their experience is improved breathing. For example, twelve patients with obstructive pulmonary disease had steam baths as part of their rehabilitation program and they demonstrated improved lung function. However there is research evidence also suggesting that such changes are in fact absent. Ernst et al and Einkenel suggest that although regular steam bathing may reduce the incidence of acute respiratory infections, it should be avoided during the acute phase of one (7, 8). Study on asthma patients in Czech and Slovakia who were reported to use saunas found that it allowed them freer breathing (9).

Some of the resources used in the steam room may actually cause symptoms. For example, some types of wood used to make sauna benches may cause contact urticaria, allergic rhinitis, and asthma in sauna builders.

In the past Steam bathing was blamed for the high incidence of lung cancer in Finland but this has been found to be attributable to smoking habits and occupational exposure and not to sauna bathing (1).

On inflammation and infections

Common cold: Although it has been widely believed that steam baths temporarily alleviate the symptoms of colds because the steam acts as a decongestant, randomized controlled study recently concluded that inhaling hot air while in a sauna has no significant impact on overall symptom severity of the common cold (10). However regular steam baths may reduce the frequency that one gets common colds as shown by a controlled study conducted on school children in Germany, half of who had steam baths weekly. It suggested that the heat increases resistance to viral infections especially common colds (9)(7). This would however not stop or shorten the course of the infection.

Rheumatic disease: Steam bathing is often used as thermal therapy to treat pain and other symptoms of rheumatic disease, but clinical studies to prove the effectiveness are limited. Studies available are based on interviews of patients with rheumatoid disease. Within these, 40% to 70% of participants reported that sauna bathing alleviated pain and improved joint mobility. About half of them experienced exacerbated pain on the day after the steam bath but reported that this pain could often be prevented by a cool shower after the steam bath. Sauna

bathing has also been reported to relieve pain in subjects with chronic neuropathic pain but also several others have reported not have experienced the change. The mechanisms by which sauna alleviates rheumatic and neuropathic pain are still not known.

Several physicians and patients also report temporary relief from pain and inflammation caused by arthritis. Sports medicine experts use the sauna to relax sore muscles and to treat minor aches after strenuous work outs.

A randomized controlled trial to clarify the effects of systemic thermal therapy in patients with chronic pain using far-infrared ray dry sauna therapy and post-sauna warming for the treatment arm found that a combination of multidisciplinary treatment and repeated thermal therapy may be a promising method for treatment of chronic pain (11).

Preliminary results from another randomized controlled trial also suggest that mild sauna therapy exerts analgesic effects in fibromyalgia with an increase of the pain-pressure-threshold (12).

On pregnancy

It is thought that exposure to intense heat similar to that in a sauna during the first trimester increases the risk of birth defects like spina bifida (9). This is according to research evidence from the Center for Human Genetics at Boston University Medical School. The noted additional risk is relatively small but nevertheless a point for caution. Two other studies, both prospective and retrospective studies, have also concluded in a similar manner casting doubt on the safety of sauna bathing during pregnancy (1).

However other studies suggest that sauna bathing during pregnancy is not associated with an increased risk of congenital malformations. For example, studies done at the University of Turku in Finland show that up to 90% of pregnant women in Finland use steam baths up until delivery and have not noted any health risks, in fact the incidence of central nervous system defects in Finland is among the lowest in the world (1). Experimental studies generally suggest that moderate sauna bathing is safe during the uncomplicated pregnancies of healthy women who are accustomed to sauna.

Although some differences in hormonal responses during a 20-minute sauna bath at 70°C have been reported, these changes have not been shown to have any major effect on fetal heart rate reactivity, uterine contractions or uterine and umbilical artery blood flow (9).

Preganancies of women using the sauna were found to continue to term, and the newborns were healthy. In hypertensive pregnant women, however, uterine vascular resistance increased during sauna bathing, suggesting that sauna bathing might not be safe and should be discontinued in high-risk pregnancies.

On fertility

Contrary to general fears, research has found that sauna use does not affect or influence fertility in any way (1). In males, serum levels of testosterone and gonadotrophins do not change even after repeated sauna use. Although a few studies had earlier reported a decreased sperm count or even decreased sperm movement after sauna bathing, studies among Finnish men have disputed this as Finnish men have been found to have high sperm counts despite their frequent use of saunas. Furthermore the time to pregnancy which is a sensitive indicator of fertility has been found to be shorter in Finland than in Britain disputing the notion that sauna bathing reduces fertility. Prolactin concentration in both men and women increases temporarily during sauna use.

On the skin

In general, sauna bathing is harmless for the skin as repeated sauna baths cause no withering of the skin and no change in transepidermal water loss. But also several people have reported that saunas may in fact be of benefit, citing the fact that when one perspires, they let out a good amount of dirt, stale body oil, dead skin, sebum and certain blood chemicals like sodium and other electrolytes which will be referred to by many sauna places as internal cleansing. A researcher called Viherjuuri agrees with this and comments that induced perspiration is the best known means of cleansing the skin. Furthermore although sauna bathing is rarely used as a therapy for skin disease, it may benefit patients with psoriasis by helping to keep skin lesions free of thick scales. Some evidence also shows that adolescents with acne may actually benefit from a steam bath. This is certain to as many beauty parlors that provide facial treatments use steaming too in a bid to cleanse the skin.

On the risks to the skin, in some atopic patients and those with cholinergic urticaria, sauna bathing may cause intense itching of the skin. In addition, contact urticaria during sauna bathing has been reported although it is rare. It may be possible to acquire fungal infections of the feet from the floor of the washing room. There has been a concern on the acquisition of sexually transmitted diseases via sauna bench surfaces is but this is highly unlikely.

Postoperative sutures: Steam baths or bathing in saunas is connected to many beliefs and traditions and one of these is that one is not allowed to do it postoperatively with sutures. This is strong a belief that it is every patient information sheet in Finland on postoperative wound care. However a randomized controlled trial to evaluate whether sauna-bathing has a negative impact on wound healing found no reason to prohibit sauna-bathing with sutures (13).

On Drugs and alcohol consumption

The effects of heat exposure on the pharmacokinetics of drugs have been explored. Studies show that the effects of hyperthermia on the absorption, distribution, and elimination of orally administered drugs are minor with drugs like propranolol, captopril, midazolam, ephedrine, and tetracycline (1). However the story is different for transdermally administered drugs like nicotine and nitroglycerin and subcutaneously administered ones like insulin whose absorption is increased because of the increased skin blood flow during a steam bath.

Vuori emphasizes that heavy meals and alcohol should be avoided (3). One should not eat for an hour before going into a steam bath, in fact avoid this for two hours if it is a big meal. This is because digestion requires a lot of blood and yet the heat in the sauna creates a big demand and a pool of it in the skin in a bid to cool down and so one might not have enough blood to do both jobs well thereby subjecting the heart to a lot of stress. However caution is made too that one should not go to the sauna hungry either. A balance struck between two and three hours after a meal may be good.

With Alcohol, this is discouraged because in a drunken state or furthermore if the alcohol puts one to sleep, one might not realize how much the temperatures around them are rising thereby putting them into heat tolerance danger that they might not respond to appropriately. In addition the impact of a unit of alcohol can be up to four times as powerful in the steam bath

environment. Carlton Hollander recommends that alcohol should be avoided prior to a sauna since it works as a depressant, with a quick flash of energy leading to a state where the blood is moving slowly and the nerve endings are shutting down.

Alcohol consumption increases the risk of hypotension and fainting in the steam bath, as well as the risk of arrhythmias and sudden and hyperthermia death especially in people with coronary heart disease. 221 out of 228 hyperthermia deaths in Finland between 1970 and 1986 happened in saunas and were considered accidents, 84% were under the influence of alcohol.

On age

As mentioned earlier, all ages have been found in the sauna but caution needs to be taken too. In Uganda it is usually the middle aged who use the sauna but in other countries for example Finland, the sauna is a family custom used by all ages. In fact there is a sauna for every five people in that country. Children usually do fine in steam baths but one needs to remember that their sweat glands are less developed than those of an adult and so they tend to prefer lower temperatures or less time there. Studies on the effect of sauna on healthy children (2-15 years) during a 10 minute sauna bath at 70°C, show that respiratory, hormonal and cardiovascular changes are similar to those in adults (1). The ability to maintain stroke volume is however impaired especially in those aged 2-5 years who have the greatest increase in heart rate. Circulatory adjustment to thermal conditions like those of an ordinary Finnish sauna bath were studied in children and adolescents in a randomized controlled trial (14). In all subjects the rectal temperature and heart rate increased during the heat exposure and systolic and diastolic blood pressures remained unchanged in sauna, but the systolic and especially the diastolic blood pressure decreased in children less than 10 years of age immediately after the heat exposure; two vasovagal collapses developed. Cardiac output increased in all but the less than 5-year-old children. This was due to a significant decrease in stroke volume (32.9%) in children less than 5 years old. Stroke volume declined slightly even in the older subjects. This indicates that the Finnish sauna bath puts great demands on a child's circulatory regulation and so to avoid possible cardiovascular side effects, it is suggested that particularly small children should be supervised carefully during sauna bathing.

With the elderly, the experience amongst individuals may be different according to how long they have been doing so. For example in Finland where it is a tradition, the elderly may tolerate the bath better because they have been doing so for all their life. However another person beginning to have these steam baths at the age of 70 or 80 may not have the same experience. However again it is dependent on the health status. Used in moderation, the steam bath should be safe for most elderly people, however those with diabetes and those with respiratory and cardiovascular conditions may not tolerate the steam bath well. Either way all people starting out with the steam bath whether young or old need to do it in moderation. There is a risk of cardiovascular complications associated with sauna if one is exposed to sudden and intensive cooling following the hot bath. For example, immersing one's face in cold water right out of the sauna.

On stress and depression

Saunas are mostly used for their relaxing effect; they help loosen and relax muscle tissue and decrease muscle tension. They increase flexibility in some cases up to as much as 10%. A randomized controlled trial was carried out to clarify on the effects of repeated thermal therapy in mildly depressed patients with appetite loss and other subjective complaints like general fatigue and mental complaints (15). Patients in the thermal therapy group were treated with 60°C far-infrared ray dry sauna among other things. It was noted that four weeks after admission, somatic complaints, hunger, and relaxation scores significantly and mental complaints slightly improved in the thermal therapy group compared with the non-thermal therapy group. Furthermore, the plasma ghrelin concentrations and daily caloric intake in the thermal therapy group significantly increased compared with the non-thermal therapy group suggesting that repeated thermal therapy may be useful for mildly depressed patients with appetite loss and subjective complaints.

On weight loss

There have been opinions that using saunas is a way to lose weight and so have attracted many users and of different ages. It is however thought that one will lose only 1-3 pounds in a typical sauna which they will gain back as soon as they drink 1-3pounds of water, juice, soda, alcohol (9). This is not a very effective measure in comparison to the alternatives.

On Hormones

The hormonal changes related to sauna use system are brief and reversible, with no permanent effects and are summarized in Table 2 below.

Table 2: Short term hormonal changes during steam bathing

Hormone	Direction of change	Magnitude of change
Adrenocorticotrophic hormone	Unchanged Or* Increased	2 – 5 fold
Aldosterone	Increased	3 – 6 fold
Angiotensin II	Increased	3 fold
Arginine vasopressin	Increased	1.5 - 2 fold
Atrial natriuretic peptide	Increased	1.5 – 3 fold
Beta-endorphin	Increased	2 – 3 fold
Cortisol	Unchanged Or* Increased Or* Decreased	1.5 – 3 fold By 10% – 40%
Epinephrine	Unchanged Or* Increased	2 – 3 fold
Follicle stimulating hormone	Unchanged	
Glucose	Unchanged Or* Increased	By 5%

Growth hormone	Increased	2 – 5 fold
Growth hormone releasing hormone	Increased	4 fold
Insulin	Unchanged	
Luteinizing hormone	Unchanged	
Norepinephrine	Increased	2 – 4 fold
Prolactin	Increased	2 – 10 fold
Renin activity	Increased	1.5 – 2 fold
Testosterone	Unchanged	
Thyroid hormone	Unchanged Or*	
	Increased	1.2 fold
Thyroid stimulating hormone	Unchanged Or*	
	Increased	1.2 – 1.8 fold

Adopted from Hannuksela and Ellahham, 2001

*Findings from different studies

Conclusion

Generally Steam bathing should be safe and of benefit in a healthy body when used at moderate levels. It may even be of benefit in people with problems like congested respiratory systems or chronic inflammatory pains among others in which it has been reported to provide relief. It still remains a major social affair for many and is usually the reason many make use of it in Uganda.

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Conflicts of interest

None known.

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