

WATER ADEQUACY AS AN ESSENTIAL ELEMENT FOR EMPOWERING PEOPLE

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I. INTRODUCTION

“Water is essential for life.”¹ Safe drinking water is so imperative that without it human beings can only survive for just two to four days; even less if compromised by ill health, heat, and other impinging conditions. It is estimated that fourteen to thirty thousand people, primarily “children and the elderly, die each day from water-related diseases.”² The World Health Organization (WHO) estimates that about 1.1 billion people lack access to a safe water source and twice that many people go without adequate sanitation.³ The increasing discussion and debate about water as a right has generally focused on access to water “of sufficient cleanliness and

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1. Barry M. Popkin, Kristen E. D’Anci & Irwin H. Rosenberg, *Water, Hydration, and Health*, 68 NUTRITION REVIEWS 8, 439 (2010).

2. Peter Gleick, *The Human Right to Water*, WATER POLICY 1, 487, 488 (1998), http://webworld.unesco.org/water/wwap/pccp/cd/pdf/educational_tools/course_modules/reference_documents/issues/thehumanrighttowater.pdf (last visited Oct. 3, 2012).

3. Kim Krisberg, *Access to Safe Water a Growing Concern Around the Globe: APHA Annual Meeting Focuses on Water*, THE NATION’S HEALTH, Oct. 2009, <http://thenationshealth.aphapublications.org/content/39/8/1.3.full>; See also Peter H. Gleick, *The Human Right to Water*, PACIFIC INSTITUTE (2007), http://www.pacinst.org/reports/human_right_may_07.pdf (last visited Oct. 3, 2012).

sufficient quantities to meet individual needs.”⁴ Quantity is described in terms of drinking, cooking, sanitation, bathing, and cleaning.⁵ Receiving far less attention and study is the actual role that water plays in health and mental health, which includes cognitive or mental processes. In fact, “it is not fully understood how hydration affects health and well-being, even as it relates to the impact of water intake on chronic diseases.”⁶

This presentation looks at what is known thus far as it relates to the actual function of water, hereafter referred to as “water hydration,” in the human body and mind. A review of the literature suggests that we are clearly under-informed on these critical needs.⁷ It is imperative that a clearer understanding of the role of water in physical and mental health is made in order for a thorough discussion to take place on the right to water. A person’s right to water is not sufficient. Right to adequate water is the critical issue. How do we know what adequate is? This examination is offered not by a scientist or a lawyer, but rather from the perspective of social work. Social work considers the person-in-environment, that is, a simultaneous look at both the human individual and that person’s inner and outer context. Such an approach often utilizes a biopsychosocial model which looks at the physiological or biological development needs, which include health, health care, and the psychological or emotional needs of individual, family, and kinship systems.⁸ Applying the biopsychosocial perspective can be valuable in the legal efforts to define and obtain water for all persons because it incorporates personal need with the contextual, environmental, and political forces at work. For purposes of discussion, this article will look at the following issues:

- 1) The role and function of water hydration in the human body relating to well-being and biological health;
- 2) The role and function of water hydration in mental functioning, mental and emotional health, including spiritual well-being; and

4. WORLD HEALTH ORGANIZATION WATER SANITATION AND HEALTH, *Content of the Human Right to Water*, http://www.who.int/water_sanitation_health/humanrights/en/index2.html (last visited Oct. 3, 2012).

5. *Id.*

6. Popkin et al., *supra* note 1, at 439.

7. Melissa C. Daniels & Barry Popkin, *Impact of Water Intake on Energy Intake and Weight Status: A Systematic Review*, 68 NUTRITION REVIEWS 9, 505 (2010).

8. BRADFORD W. SHEAFOR & CHARLES HOREJSI, TECHNIQUES AND GUIDELINES FOR SOCIAL WORK PRACTICE 7 (Allyn & Bacon eds., 9th ed. 2012).

- 3) The role and function of water adequacy as part of an essential element in empowering people who are oppressed and without privilege.

II. THE ROLE AND FUNCTION OF HYDRATION RELATING TO BIOLOGICAL WELL-BEING

“Water is essential for life.”⁹ “From the time that primeval species ventured from the oceans to live on land, a major key to survival has been the prevention of dehydration.”¹⁰ Cells in the human body cannot function without hydration; intracellular fluid accounts for fifty-five percent of total body water.¹¹ Plasma contains about 7.5% of total body water. Generally for infants, water, which is essential for life, comprises approximately seventy-five percent of the body weight. For older adults, water comprises about fifty-five percent of the body weight.¹² In healthy adults, water represents an average of fifty-nine percent for males, and fifty-six percent for females according to body mass.¹³

Body fluids serve a variety of functions in the human body, including a key role in the digestion, absorption and transportation of other nutrients, formation and stability of cell structure, removal of waste products and toxins, as a solvent for biochemical reactions, thermoregulation of the human body, and lubrication of cavities such as joints.¹⁴

Concurrently, it is critical to note that hydration or fluid balance must be continually recycled, creating an ongoing need for a lifetime.

Perhaps most familiar to the public in the discussion of water adequacy is the concept of thirst as an indicator of the need for water. As a thermo-regulator, hydration serves as the body’s cooling system. While there are some studies concerning dehydration and heat dissipation in athletes, there appears to be a dearth of research examining the working person, much less those living in poverty or on the margins. Research indicates that when the hydration of the cooling system is adequate, “we can work in the heat. However, if not properly replaced, fluid loss under

9. Popkin et al., *supra* note 1, at 439.

10. *Id.*

11. Stavros A. Kavouras & Costas Anatasίου, *Water Physiology: Essentiality, Metabolism, and Health Implications*, 45 NUTRITION REVIEWS 6S, S27 (2010).

12. Popkin et al., *supra* note 1, at 439.

13. Kavouras & Anatasίου, *supra* note 11, at S28.

14. *Id.*

the form of sweat results in dehydration.”¹⁵ Further, those engaging in prolonged exercise (more than ninety minutes to greater than two to three hours), hydration through water is adequate.¹⁶

Beyond these general thresholds, minerals are needed as well.¹⁷ Few studies have been made of the long-term effects of water deprivation. One limited study in 1944 involved subjecting healthy male soldiers to a six-day period of water and food deprivation.¹⁸ The study noted that the soldiers exhibited lassitude and irritability.¹⁹ Another study of lesser duration noted subjects had a slight change of voice, sunken and pale face, and cyanosed lips.²⁰ “Although a clear picture of human physiology under chronic and severe dehydration has not been obtained, the aforementioned studies indicate that chronic dehydration represents a threat to body homeostasis and health.”²¹ Studies of water and hydration in physical activity, particularly athletes and those in the military, reveal that even mild levels will result in reduced endurance, increased fatigue, altered thermoregulatory capability, reduced motivation, and increased perceived effort.²² Additionally, the indicator of “thirst” is but one variable in determining water adequacy. Much more research must be done.

Children in warm climates may be more susceptible to illness than adults without adequate hydration.²³ Likewise, the elderly are less able to compensate with heat stress and water loss. As such, they have hypodipsia, which can be exaggerated by central nervous system disease and dementia.²⁴ “Although not consistent, hydration status and fluid intake have been associated with many chronic diseases, including urolithiasis, urinary tract infections, bladder and colon cancer, constipation, bronchopulmonary disorders, hypertension, cerebral infarct, fatal coronary

15. Francois Peronnet, *Healthy Hydration for Physical Activity*, 45 NUTRITION TODAY 6S, S41 (2010); See also F. Bellisle, Simon N. Thornton, P. Hebel, M. Denizeau & M. Tahiri, *A Study of Fluid Intake From Beverages in a Sample of Healthy French Children, Adolescents, and Adults*, 64 EUROPEAN JOURNAL OF CLINICAL NUTRITION 350–55 (2010).

16. *Id.* at S42.

17. *Id.*

18. Kavouras & Anatsiou, *supra* note 11, at S29.

19. *Id.*

20. *Id.*

21. *Id.*

22. Popkin et al., *supra* note 1, at 443.

23. Popkin et al., *supra* note 1, at 442.

24. *Id.*

heart disease, venous thromboembolism, mitral valve prolapsed, diabetic ketoacidosis, dental diseases, gallstones, and glaucoma.”²⁵

Recently the European Food Safety Authority (EFSA) was asked to revise existing “recommended intakes of essential substances with a physiological effect, including water since this nutrient is essential for life and health.”²⁶ Interestingly, there is no gold standard for hydration. As a consequence, the effects of mild dehydration on the development of several disorders and diseases have not been well-documented.²⁷ The issue of fluid balance, which is the ability of the human body to maintain adequate hydration over time, continues to be a concern that remains unknown. Recommendations for future research include the examination of water physiology and the association between fluid balance or intake and disease at both molecular and epidemiological levels as well as appropriate methodologies to assess fluid balance and water requirements.²⁸ Research instruments need to be designed that record only fluid intake and be of such quality as to identify those who under-consume fluid as an “at risk” subgroup in each population.²⁹ Currently, “there are presently no acceptable biomarkers of hydration status at the population level, and controversy exists about the current knowledge of hydration status among older Americans.”³⁰ Meanwhile, the invisible population of poor, disenfranchised, underserved, and marginalized populations throughout the world lack access to adequate hydration and fluid. This issue will receive further attention in the final section of this narrative.

III. THE ROLE AND FUNCTION OF WATER/HYDRATION IN MENTAL FUNCTIONING AND MENTAL AND SPIRITUAL HEALTH

“It is surprising how little information is available regarding the effects of dehydration on human cognitive function.”³¹ The absence of an operational definition of cognition creates ongoing challenges to research and study viable to develop a uniform working language. Nonetheless it is essential to continue to explore the implications of dehydration or water

25. Kavouras & Anatsiou, *supra* note 11, at S29.

26. Popkin et al., *supra* note 1, at 439.

27. *Id.*

28. Kavouras & Anatsiou, *supra* note 11, at S31.

29. See Laurent Le Bellego et al., *Understanding Fluid Consumption Patterns to Improve Healthy Hydration*, 45 NUTRITION TODAY 6S, S22–26 (2010) (discussing the importance of the quantity and quality of the fluids we drink every day and available recommendations for fluid intake).

30. Popkin et al., *supra* note 1, at 453.

31. Harris R. Liebermann, *Hydration and Human Cognition*, 45 NUTRITION TODAY 6S, S33 (2010) (discussing the importance of hydration for optimal brain function).

insufficiency on human mental performance and health. Although some studies provide vital information, they are limited in scope. It is known that mild dehydration can affect cognitive function such as alertness and short-term memory in children and younger and older adults.³² Mild to moderate dehydration can impair performance on tasks involving such functions as short-term memory, perceptual discrimination, visuomotor tracking, ability to do math, and psychomotor skills.³³ Mood, fatigue, confusion, and anger can also be more easily manifested when individuals are dehydrated.³⁴ A study conducted at the Indian Defense Institute of Physiology and Allied Sciences suggested that dehydration levels of two percent or more impair particular functions of short-term memory, reasoning, and hand-eye coordination.³⁵ One study by Gabor Szinnai, et al. revealed that several reaction time-based responses indicated significant interactions between gender and dehydration. There were prolonged reaction times in women but shorter reaction times in men after water deprivation.³⁶ This indicates that “dehydration frequently results in delirium as a manifestation of cognitive dysfunction.”³⁷

Along these lines, the research that has been conducted and the literature that has been reviewed consistently reiterate that “despite its well-established importance, water is often forgotten in dietary recommendations, and the importance of adequate hydration is not mentioned.”³⁸ Consistent themes emerge from what is known. Prolonged dehydration, particularly in children and elderly populations, results in

32. Popkin et al., *supra* note 1, at 443.

33. *Id.*

34. *Id.*

35. Liebermann, *supra* note 31, at S34; some studies are limited in that they rely on self-report of tiredness and mood. There is some evidence that women are more affected in mood than males with moderate dehydration. See also a recent study by the Mayo Clinic 2008, that revealed that mild dehydration corresponding to only 1–2% of body weight loss in adults can lead to a significant impairment in alertness, concentration, and short-term memory. E. Jequier & F. Constant, *Water as an Essential Nutrient: The Physiological Basis of Hydration*, 64 EUROPEAN JOURNAL OF CLINICAL NUTRITION 115, 116–23 (2009), available at <http://www.nature.com/ejcn/journal/v64/n2/abs/ejcn2009111a.html#aff2> (last visited Oct. 3, 2012) (discussing effects of dehydration).

36. Gabor Szinnai et. al., *Effect of Water Deprivation on Cognitive-Motor Performance in Healthy Men and Women*, 1 AMERICAN JOURNAL OF PHYSIOLOGY 275, 277 (2005), available at <http://ajpregu.physiology.org/content/289/1/R275.full.pdf> (last visited Oct. 3, 2012) (discussing the effect of dehydration on cognitive-motor performance in healthy people).

37. Margaret-Mary G. Wilson & Joseph E. Morley, *Impaired Cognitive Function and Mental Performance in Mild Dehydration*, 57 EUROPEAN JOURNAL OF CLINICAL NUTRITION S2, S24 (2003), available at <http://ajpregu.physiology.org/content/289/1/R275.full.pdf> (last visited Oct. 3, 2012) (discussing how mild dehydration impairs cognitive function and mental performance).

38. See Jequier & Constant, *supra* note 35 at 116.

cognitive impairments that can affect memory, performance, learning, concentration, and mood. Far less understood and studied, however, are the marginal, oppressed, invisible populations living in the depths of poverty and working under hazardous conditions. It is important to note that most studies have been conducted on the hearty, well, that is, military personnel, athletes, or educated. These variables alone constitute only a limited elite and privileged population. The discussion of water as a human right must include parameters of water adequacy and promote research to better and more thoroughly discover what marginalized populations experience and need. In this regard, social work is a kindred spirit, having its roots deep into social reform and social justice.³⁹

From a biopsychosocial perspective that considers people in context, there are two connecting issues of critical importance. Both issues are connected to the physical, emotional, and mental well-being. The first is the inextricable link between water and religion—including spiritual practices. The second issue is the hazards that people encounter in trying to obtain water daily. One might argue that religion and spiritual practices preserve the well-being of people and their cultures. We will examine this connection first.

Most often disregarded in the discussion of adequate and potable water is the role of water in religion and spiritual practices. This dimension is of such essential and central importance that no discussion of human needs can exclude it without unraveling the very fabric of most cultures. Water plays a central role in many religions and beliefs around the world: it is 1) a source of life; and 2) it cleans the body, which by extension purifies it.⁴⁰ These two main qualities confer a highly symbolic, sacred status to water. *Navajo Nation v. United States Forest Service* further illustrated this point.⁴¹ Under the Religious Freedom Restoration Act (RFRA), the Ninth Circuit Court of Appeals stopped the expansion of an Arizona ski resort that would have used artificial snow made from reclaimed water on a mountain

39. Code of Ethics of National Association of Social Workers of 2008, Rule 6.04(a) (requiring social workers to engage in social and political action that seeks to ensure that all people have equal access to resources needed to meet basic human needs. In so doing, water adequacy is of critical importance in defining “basic human need.”).

40. *Water in Religion*, THEWATERPAGE.COM, <http://www.thewaterpage.com/religion.htm> (last visited Oct. 3, 2012) [hereinafter *Water In Religion*].

41. See *Navajo Nation v. U.S. Forest Serv.*, 479 F.3d 1024 (9th Cir. 2007). (“The Arizona Snowbowl is a privately-owned ski area situated in the Cuconino National Forest, on the Peaks, and is operated under a 777-acre Forest Service Special Use Permit In 1979, the Forest Service approved a series of upgrades, including new lifts, trails, and facilities.”).

that is sacred to a number of Indian tribes.⁴² The “Peaks,” as they are commonly referred, are most sacred to the Hopi and Navajo. These tribes’ religions have existed for centuries and “require pure natural resources from the Peaks, including, in particular spring water.”⁴³ At issue was that pure mountain water was needed for particular ceremonies and such water could not be contaminated. Further, it was believed that the absence of the spring water “would prevent them from maintaining daily and annual religious practices comprising an entire way of life because the practice requires a connection to the mountain and a belief in the mountain’s purity”⁴⁴ The decision upheld the tribes’ right to religious freedom, which was likely to be further challenged by the defendant ski resort.

Religions and spiritual practices throughout the world mirror the sacredness of water to physical, emotional, and spiritual well-being. For example, water is used in Buddhist funerals.⁴⁵ In Christianity, water is intrinsically linked to baptism, symbolizing purification and the rejection of the original sin.⁴⁶ In Hinduism, all temples are located near a water source and followers must bathe before entering the temple. There are a number of functions of water in Islam, such as washing the whole body—it is obligatory after sex and recommended before the Friday prayers—before touching the Koran and before each of the daily prayers. Based on the veneration of the Kami, Shinto beliefs require one to begin worship of the Kami by ritual purification with water. In Judaism, water is used for ritual cleansing to restore or maintain a state of purity.⁴⁷ While there is not an exact translation or word for ‘religion’ in Africa, there are a number of terms that describe practices and systems of thought that correspond “closely to what most Westerners mean by religion.”⁴⁸

For many, particularly in the vast areas of East, West, Central, and Southern Africa, farmers are dependent on rain for their very survival; thus, “rain is an important focus of religious practice.”⁴⁹ For the White Mountain

42. See Advisories & Insights, BULLIVANT HOUSER BAILY PC, http://www.bullivant.com/latex/5260_0mj0ot55n4kfire1l2nbnx2i.pdf (last visited Sept. 8, 2011) (stating this snow made with reclaimed water interferes with tribes’ religious practices).

43. *Id.*

44. *Id.*

45. *Water In Religion*, *supra* note 40.

46. *Id.*

47. *Id.*

48. Indigenous African Religions: Explore, EXPLORING AFRICA, <http://exploringafrica.matrix.msu.edu/students/curriculum/m14/activity2.php> (last visited Sept. 9 2012) [hereinafter *Indigenous African Religions: Explore*].

49. *Id.*

Apache religion, there are Water People in human form.⁵⁰ For most of the populations of the world, religious and spiritual practices are essential and critical to well-being. It is not uncommon for persons deprived of water to believe that such a calamity is caused by the failure to carry out proper religious practices that frequently include the use of purified clean water.⁵¹

The second issue is directly related to the lack of adequate and adequately clean water and the degree that people—most often women and children—are compelled to put themselves in harm's way to obtain such water. In this regard, the external environment poses direct danger to them. In the developing world, the struggle to gain access to clean water is accompanied with many other risks that people must face on a daily basis for survival. From the threat of water or vector-borne illness to the threat of rape, the dangers confronted by the people facing water scarcity are vast and numerous.

An important aspect of the risks and dangers that are presented by water scarcity is the increased threat to women and children.⁵² UN Water reports, “[w]hen water is scarce, women and girls may have to travel longer distances to obtain water, and conditions are more dangerous.”⁵³ UNICEF Executive Director Ann M. Veneman, who has also been to the Eastern part of the Democratic Republic of the Congo, observed that “when you have spoken to these women and girls, and listened to their stories, you clearly understand just how devastating their circumstances are. Simple, everyday tasks, like gathering wood or fetching water, expose them to grave danger.

50. Grenville Goodwon, *White Mountain Apache Religion*, 40 AM. ANTHROPOLOGIST 1 (2009), available at <http://onlinelibrary.wiley.com/doi/10.1525/aa.1938.40.1.02a00040/pdf> (last visited Oct. 3, 2012).

51. See Indigenous African Religions: Explore, *supra* note 48.

African religious traditions, as with Islam, Christianity, Judaism, and other major world religions, hold that just as there is good in the world, there is also evil. Goodness is the result of the blessings of God and the spiritual world in response to good behavior on the part of individuals and communities

52. Hilary Wighton, *Clean Water in Developing Countries* (Dec. 2009) (unpublished senior paper, California Polytechnic State University, San Luis Obispo) available at <http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1009&context=socssp> (last visited Oct. 3, 2012).

53. *Id.* (citing Water, Sanitation and Hygiene, UNICEF, http://www.unicef.org/wash/index_3951.html (last visited Sept. 9, 2012)) and Water, Sanitation and Hygiene – Women and Wash, UNICEF, http://www.unicef.org/wash/index_womenandgirls.html (last visited Oct. 3, 2012).

They must be allowed to live in a secure environment.”⁵⁴ Clearly women and children are most expendable and vulnerable in this related issue of water.

IV. WATER ADEQUACY: AN ESSENTIAL ELEMENT IN EMPOWERING PEOPLE WHO ARE OPPRESSED AND WITHOUT PRIVILEGE

Turning to the effects of dehydration on mental functioning and mental health, it is clear from review of the literature that there is a dearth of scientific studies concerning these two dimensions. The majority of studies that do exist use hearty, well populations that include the military, athletes, and the educated as a source of information. We learned that water serves critical functions in digestion, absorption, transportation of nutrients, and preventing the body system from overheating. Further, we know that water hydration must be maintained continually, and is a non-negotiable item in securing and maintaining human well-being. Continued hydration or water replenishment is needed for optimal biological and psychological functioning. This is referred to as water adequacy.

Limited studies have demonstrated that even mild to moderate hydration can impair performance on tasks involving short-term memory, psychomotor skills, mood, fatigue, confusion, and even delirium. Studies have focused on the privileged and have excluded the marginalized, oppressed populations of the nation and the world. Unfortunately, these are the very populations whose need for water and water adequacy have remained unstudied. Such populations include those in countries where water is extremely limited in supply. These countries have limited water supply by virtue of being controlled and oppressed. As such, they cannot access water nor achieve water adequacy. This author contends that there is a vested interest by those in power to maintain control of water and limit water adequacy over marginalized populations in order to preserve that power.

Rooted deeply in a history of social reform and justice, social work practice is fueled through the belief “that many personal difficulties are the result of social and economic structures that make it impossible for people to utilize the strengths and competencies they do possess.”⁵⁵ Further

54. Press Release, UNICEF, V-DAY, UNICEF call for end to rape, sexual torture against girls in eastern DRC (Aug. 7, 2007) available at http://www.unicef.org/media/media_40512.html (last date visited Oct. 3, 2012).

55. BRADFORD W. SHEAFOR & CHARLES J. HOREJSI, *TECHNIQUES AND GUIDELINES FOR SOCIAL WORK PRACTICE* 280 (9th ed. 2012) (“Fundamental to empowerment is the conviction that each individual must be able to be an active participant in social and political action which can include the distribution of vital resources such as water”).

examination reveals that for the powerful and wealthy, there is a distinct utilitarian use for large, impoverished populations. The powerful and wealthy who use the “poor people [who] can do the dirty work for rich people, are more willing to take service jobs or jobs that require hard labor or posing a danger”⁵⁶

Water and water adequacy are useful weapons of coercive control for those in power. A brief examination reveals that the methods used to control people, whether hostages, political prisoners, victims of human trafficking, or domestic violence are universal.⁵⁷

The perpetrator supervises what the victim eats, when she sleeps, when she goes to the toilet, what she wears. When the victim is deprived of food, sleep, or exercise this control results in physical debilitation.⁵⁸

Therefore, when water and water adequacy is controlled, it is argued that those in power can create a population that is compromised physically and mentally due to dehydration. A compromised population is more easily dominated and subject to the will of those in power. Further, people in continual weakened and compromised conditions may be less of a threat or rival force against oppression. In addition to personal, physiological, and mental processes, water also serves a multitude of other functions such as sanitation, agriculture, and quality of life related uses.

V. CONCLUSION

For purposes of showing the critical nature of water to human survival and well-being, the essential issues come down to the primacy of human survival. Water becomes a political weapon of coercive control. It serves those in power by maintaining control over resources that, if abundant and adequate, can enhance the overall well-being of marginalized and disenfranchised populations. Furthermore, it is most often these marginalized and oppressed populations that perform the most arduous labor, leading to possible permanent injury, impairment, or even death. It is for these reasons that water adequacy is an essential element in the battle for human empowerment and equality.

56. KAREN KIRST-ASHMAN, *SOCIAL WORK AND SOCIAL WELFARE CRITICAL THINKING PERSPECTIVES* 210 (3d ed. 2010).

57. JUDITH HERMAN, *TRAUMA AND RECOVERY: THE AFTERMATH OF VIOLENCE—FROM DOMESTIC ABUSE TO POLITICAL TERROR*, 77 (BASIC BOOKS 1997) (discussing methods of establishing control are organized techniques of disempowerment and disconnection).

58. *Id.*