

They Starved So That Others Be Better Fed: Remembering Ancel Keys and the Minnesota Experiment

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ABSTRACT During World War II, 36 conscientious objectors participated in a study of human starvation conducted by Ancel Keys and his colleagues at the University of Minnesota. The Minnesota Starvation Experiment, as it was later known, was a grueling study meant to gain insight into the physical and psychologic effects of semistarvation and the problem of refeeding civilians who had been starved during the war. During the experiment, the participants were subjected to semistarvation in which most lost >25% of their weight, and many experienced anemia, fatigue, apathy, extreme weakness, irritability, neurological deficits, and lower extremity edema. In 2003–2004, 18 of the original 36 participants were still alive and were interviewed. Many came from the Historic Peace Churches (Mennonite, Brethren, and Quaker), and all expressed strong convictions about nonviolence and wanting to make a meaningful contribution during the war. Despite ethical issues about subjecting healthy humans to starvation, the men interviewed were unanimous in saying that they would do it all over again, even after knowing the suffering that they had experienced. After the experiment ended, many of the participants went on to rebuilding war-torn Europe, working in the ministries, diplomatic careers, and other activities related to nonviolence. *J. Nutr.* 135: 1347–1352, 2005.

KEY WORDS: • *experiment* • *history* • *starvation* • *Keys*

On November 19, 1944, 36 healthy young men entered the brick confines of the Laboratory of Physiological Hygiene at the University of Minnesota, where they were to embark on a grueling medical experiment. The men had responded to a brochure that asked: “Will You Starve That They Be Better Fed?” (1) (Fig. 1). World War II was coming to a close, and Allied forces, entering cities in German-occupied Europe, encountered starved, emaciated civilians, many of whom had survived by subsisting on bread, potatoes, and little else. Relatively little was known scientifically about human starvation or how to deal with refeeding people who had undergone this extreme degree of deprivation. In 1944 Ancel Keys, then a young professor of physiology at the University of Minnesota and a consultant to the War Department, asked how civilians would be affected physiologically and psychologically by such a limited diet and what would be the most effective way to provide postwar rehabilitation (2). To answer these questions, Keys proposed a bold human experiment: to subject volunteers to semistarvation and then refeed them.

The results of the research, later known as the Minnesota Starvation Experiment, were published by Keys and his colleagues in the classic 2-volume monograph, *The Biology of Human Starvation*, in 1950 (3), providing a unique addition to the nutrition literature. The 1385-page text presented the first comprehensive record of the physiological and psychological effects of starvation and refeeding, included detailed test results for each of the participants, and provided an extensive

bibliographic literature review. Beyond the sheer depth of technical information the experiment made publicly available, members of Keys’ research team prepared a relief worker’s manual that focused on the psychological effect of starvation, with an eye toward practical field application related to the attitude and behavior patterns of those who have experienced starvation (4). The understanding that starvation dramatically alters personality and that nutrition directly and predictably affects mind as well as body is one of the legacies of the experiment. The results of the experiment also affected general scientific attitudes about the mutability of the human body, suggesting that diet alone could have a large effect on basic body functions, e.g., blood pressure, cholesterol level, resting heart rate, areas previously considered relatively fixed. The experiment continues to be cited by researchers exploring the effects of food deprivation on the cognitive and social functioning of those with anorexia nervosa and bulimia nervosa (5,6). In some cases, sharing the details of the experiment with patients has also proved therapeutically beneficial in explaining the effect of starvation on their own bodies (7). In addition, the data have been useful in exploring metabolic adaptation (8,9), as researchers look to find insights into the clinical management of cachexia and obesity and the prediction and treatment of weight changes related to illness and injuries (10–12).

In 1944, the prospect of finding healthy young men who would volunteer for such an ordeal presented a challenge because many were overseas serving in the military. However, stateside, there were conscientious objectors who had refused to serve in the war and received 4E classification from their

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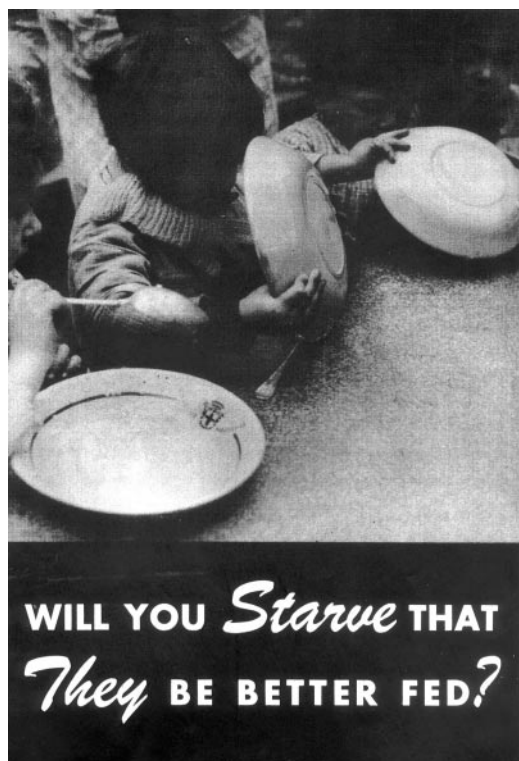


FIGURE 1 Recruitment brochure cover for the Minnesota Experiment. May 27, 1944.

draft boards. Conscientious objectors were assigned to the Civilian Public Service (CPS), where they participated in activities such as soil conservation, forest maintenance, and firefighting in work camps operated by the Historic Peace Churches (Mennonites, Quakers, and Brethren) (13). As the war progressed, conscientious objectors were also given the opportunity to volunteer for alternative service projects, including various medical experiments in which they served as human “guinea pigs.” Keys obtained approval from the War Department to find suitable healthy men among the 12,000 conscientious objectors across the country. Brochures asking for volunteers were printed and disseminated among the work camps and sites of the CPS, and within a few months, Keys received >400 positive responses. Of these, 100 were interviewed and examined before 36 subjects were finally selected. The experiment was funded by the Office of the Surgeon General, organizations related to the Mennonites, Brethren, Quakers, and Unitarians, and some private industry groups.

The main objective of the Minnesota Experiment was to characterize the physical and mental effects of starvation on healthy men by observing them under normal (baseline) conditions, subjecting them to semistarvation, and then following them under conditions of rehabilitation. The study commenced in November 1944 with a standardization period of 3 mo in which the men received ~3200 kcal (13,389 kJ) of food/d. This was followed by a 6-mo semistarvation period, beginning on February 12, 1945, in which they received ~1800 kcal (7531 kJ) of food/d, with the starvation diet reflecting that experienced in the war-torn areas of Europe, i.e., potatoes, turnips, rutabagas, dark bread, and macaroni. The final 3 mo were a nutritional rehabilitation period, in which the men were randomly assigned to 1 of 4 energy intake groups; each energy level was subdivided into 2 protein levels, and each protein level into 2 vitamin levels.

During the study, participants were assigned to various housekeeping and administrative duties within the laboratory and were allowed to participate in university classes and activities. The participants were expected to walk 22 mi (35.4 km)/wk and expend 3009 kcal (12552 kJ)/d. The Laboratory of Physiological Hygiene, located in the South Tower of the football stadium at the University of Minnesota, also served as their dormitory. Keys referred to these windowless rooms as “our cage” (1). Extensive tests were given to the participants throughout the experiment. Body weight, size, and strength were recorded, and basic functions were tracked using X-rays, electrocardiograms, blood samples, and metabolic studies. Psychomotor and endurance tests were given as the men walked or ran on the laboratory treadmills, and participants received intelligence and personality tests from psychologists. Each man was required to keep a personal journal during the experiment.

Almost 60 years after the Minnesota Experiment, 19 of the 36 original participants were still alive and 18 were interviewed in an oral history project conducted from July 2003 through February 2004. The purpose of the project was to document how World War II conscientious objectors remember their participation in the Minnesota Experiment. The names of the participants have been published (3). A letter was sent to each participant, inviting him to take part in a tape-recorded, structured interview. After oral consent was obtained, 14 participants were interviewed in their homes or offices, and 4 were interviewed by telephone. The protocol was approved by the Institutional Review Board of the Johns Hopkins School of Medicine.

Each man was in his 80s when interviewed and each spoke passionately when discussing why he chose to be a conscientious objector. The men universally stated a simple, solid conviction not to kill another human being. For some, the conviction was borne of an upbringing in one of the Historic Peace Churches. Others were influenced by pacifist writers such as Wilfred Grenfell (1865–1940), leaders of peace fellowships, or the teachings of the Oxford Movement. Still others saw the life and work of Mahatma Gandhi (1869–1948) as a testament to the potential effectiveness of nonviolence. William Anderson put it most succinctly: “No one could make me kill anyone else.” Carlyle Frederick stressed that conscientious objection was not unpatriotic: “[Some] thought conscientious objection would be almost like being a traitor. But I was not objecting to my country as much as what my country was doing. In other words, my definition of patriotism included my refusal to kill.”

Despite their sincere belief that taking up arms was not the answer, many struggled with the desire to do something of real meaning for their country. Marshall Sutton remembered, “Our friends and colleagues in other places were putting their lives on the line, and you know, we wanted to do the same.” Samuel Legg spoke in similar terms: “So we in the CPS camps had been griping about not having what we called significant work, which very often it wasn’t. A lot of it was boondoggling . . . We were full of idealism . . . Everyone else around us is pulling down the world; we want[ed] to build it up.”

Those selected to participate in the Minnesota Experiment were a well-educated group of conscientious objectors; all had completed some college coursework, 18 had graduated, and a few had already begun graduate-level coursework. Many took advantage of the opportunity to take coursework at the University of Minnesota during the experiment, a few completing enough to obtain additional degrees. Initially, the blue pants, white shirts, and sturdy walking shoes they were issued upon arrival were all that distinguished them from other members of

the community. During the standardization period, the men felt well-fed and full of energy. Many initially volunteered in local settlement houses, participated in music and drama productions in Minneapolis, and took advantage of the various cultural activities available throughout the city. Robert Villwock played the accordion and called square dances for local groups, and Wesley Miller ushered for the Minneapolis Symphony Orchestra in exchange for attending the concerts for free.

On d 1 of semistarvation, February 12, 1945, the men sat down to a meal that included a small bowl of farina, two slices of toast, a dish of fried potatoes, a dish of jello, a small portion of jam, and a small glass of milk. Although the precise nutrition content of meals and the individual results from various tests and measurements are presented in scientific detail in *The Biology of Human Starvation*, the participants painted a more vivid picture of their daily lives during the experiment. The men ate their meals together in Shevlin Hall on the campus. Two meals were served Monday through Saturday, at 0800 and 1800 h, and on Sunday there was one slightly larger meal served at 1245 h. Originally, the football team also received meals at about the same time, but the campus authorities later announced a change in the schedule so that the players would not be fraternizing with conscientious objectors. Participants were supposed to lose ~2.5 lb (1.1 kg)/wk to reach the desired 25% weight reduction by the end of the semistarvation period. The amount of food each man received at mealtimes depended on how well he was progressing toward his weekly goal. Usually reductions and additions were made in the form of slices of bread. Daniel Peacock remembered that emotions could run quite high in the cafeteria when one man received even just a little bit more food: "We were given our food along a cafeteria line and if the guy ahead of you is given five slices of bread, that's pretty hard to conceal. And if you're only getting three, that's pretty touchy." He also spoke of the anxiety that accompanied the Friday night posting of the upcoming week's rations: "... every Friday late in the day ... they would post a list of all our names and what our rations would be for the following week ... [the] calories ... either minus or plus ... Some of us ... we'd go off to a movie. In other words, we delayed seeing that list; we dreaded seeing that list for fear that it was certainly going to reduce our rations ... It's pretty darn certain that it's going to be bad news because we're supposed to be descending."

The men slept in a large dormitory-style room with 2 rows of cots positioned with an aisle down the middle. Daniel Peacock described the lack of privacy and explained how it was in keeping with the spirit of the experiment:

The showers were all one huge line of showers. No partitions or anything. And even the commodes were all open. There was no privacy anywhere ... And in a way it's just as well because part of being a guinea pig is that they're going to look at everything that they can look at, touch and feel every part of your body in one way or another, at one time or another, for one reason or another.

After one participant broke diet and was excused from the experiment, a buddy system was implemented that required the men to travel in twos when outside of the Laboratory. Jasper Garner was thankful for the buddy system for reasons of physical practicality, as they were growing weaker by the day: "... before the buddy system, I was in Dayton's department store downtown going to go in. It's got a rotating door. I couldn't push it. I got stuck. Had to wait until somebody came along. And then the other one was, you know, the library doors. Oh you know, they're big, and I couldn't pull them. I had to wait until somebody ... let me scoot in after."

Nearly all the men remembered the walks they took with their buddies to fulfill their weekly 22-mi (35.4-km) walking requirement. Although some of the requirement could be met indoors on the treadmill, many preferred to use the paths along the banks of the Mississippi River. Jasper Garner recalled one particular strategy for meeting the requirement: "Roscoe Hinkle and I figured out we'd take the eleven mile walk every Sunday night, and then we had half of our walking done, and the rest of the week was no problem at all. In contrast to some, who suddenly on Saturday night are walking on the treadmill for hours to get in the time."

As semistarvation progressed, the enthusiasm of the participants waned; the men became increasingly irritable and impatient with one another and began to suffer the powerful physical effect of limited food. Carlyle Frederick remembered "... noticing what's wrong with everybody else, even your best friend. Their idiosyncrasies became great big deals ... little things that wouldn't bother me before or after would really make me upset." Marshall Sutton noted, "... we were impatient waiting in line if we had to ... and we'd get disturbed with each other's eating habits at times ... I remember going to a friend at night and apologizing and saying, 'Oh, I was terrible today, and you know, let's go to sleep with other thoughts in our minds.' We became, in a sense, more introverted, and we had less energy. I knew where all the elevators were in the buildings." The men reported decreased tolerance for cold temperatures, and requested additional blankets even in the middle of summer. They experienced dizziness, extreme tiredness, muscle soreness, hair loss, reduced coordination, and ringing in their ears. Several were forced to withdraw from their university classes because they simply didn't have the energy or motivation to attend and concentrate (3).

Food became an obsession for the participants. Robert Willoughby remembered the often complex processes the men developed for eating the little food that was provided: "... eating became a ritual ... Some people diluted their food with water to make it seem like more. Others would put each little bite and hold it in their mouth a long time to savor it. So eating took a long time." Carlyle Frederick was one of several men who collected cookbooks and recipes; he reported owning nearly 100 by the time the experiment was over. Harold Blickenstaff recalled the frustration of constantly thinking about food:

I don't know many other things in my life that I looked forward to being over with any more than this experiment. And it wasn't so much ... because of the physical discomfort, but because it made food the most important thing in one's life ... food became the one central and only thing really in one's life. And life is pretty dull if that's the only thing. I mean, if you went to a movie, you weren't particularly interested in the love scenes, but you noticed every time they ate and what they ate.

Several of the men, like Max Kampelman, agreed that nearly immediately after semistarvation began, all interest in women and dating was lost: "I can tell you, the sex drive disappeared. There was none." Samuel Legg recalled that the most poignant moment in the experiment for him was related to an emotional reaction caused by his increasing physical weakness and exhaustion:

I was walking along ... [with my] buddy ... it was deep into the semistarvation, and we were tired ... we would look for driveways when we got to a cross street ... so we wouldn't have to walk up one step to get from the road to the sidewalk ... And so we would walk in the gutter for awhile, looking for a driveway. We were tired and weak. And so we were standing at a corner waiting for a light or something, and a kid came along on a bicycle, and he was really moving,

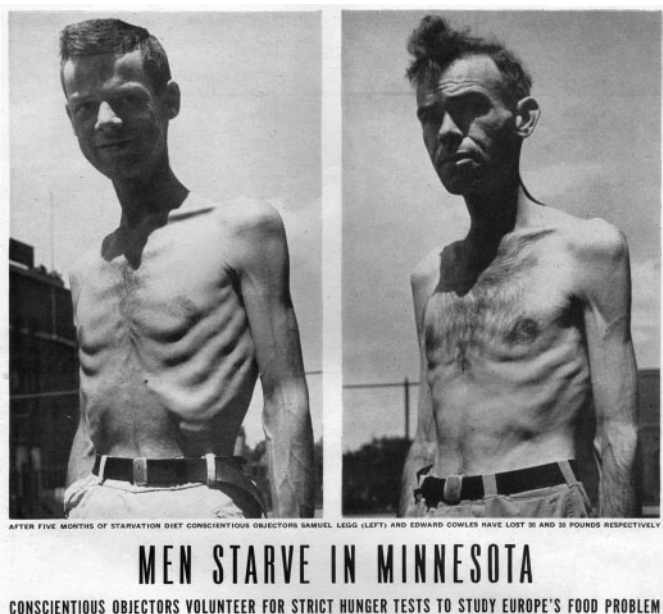


FIGURE 2 *Life* magazine photograph of conscientious objectors during starvation experiment. July 30, 1945. Volume 19, Number 5, p. 43. Credit: Wallace Kirkland/Time Life Pictures/Getty Images.

pumping away . . . And I looked at him and said, "Wow, look at that boy. He's really whizzing." And then I said to myself, "I know where he's going. He's going home for supper. And I'm not." And then for a very brief, I hope it was brief, moment . . . I suddenly hated the boy . . . I hate at this point to tell you this, because it doesn't speak very well for me. But I remember . . . with . . . horror that I could feel such a thing. So utterly irrational, but there it was. And you ask an experience that I remember; I sure remember that. That was rough.

The men became more noticeable around campus as they began to manifest visible signs of starvation, sunken faces and bellies, protruding ribs, and edema-swollen legs, ankles, and faces. Other problems such as anemia, neurological deficits, and skin changes became apparent. Suddenly, the story reached millions of Americans. Robert McCullagh remembered: "Well, there was a long period when nobody gave any attention to it because they didn't even know the experiment was going on. But somewhere it broke . . . we were then besieged by the Minneapolis and St. Paul press. They wanted to know all about the experiment. And then out of that I think grew the contact with *Life* magazine." The July 30, 1945 edition of *Life* magazine carried an article entitled "Men Starve in Minnesota," with several striking photographs of the volunteers (14) (Figs. 2, 3). Local papers began tracing the progress of the human "guinea pigs" and detailing their bodily decline. Even with the increased media attention, the design and execution of the experiment remained constant. The *St. Paul Dispatch* reported: ". . . the . . . men on the starvation diet have lost so much physically and mentally that their ambition is gone, their will to go forward is gone, and they cannot do heavy work such as farming, mining, forestry, lifting and many other types of work necessary to rebuild war-torn Europe" (15). The *Minneapolis Star-Journal* described: ". . . one of the men was walking past a bakery and was so tempted by the rich odors wafting from the place that he rushed in and bought a dozen doughnuts. He gave them to children in the street and watched with relish as they ate them" (16). An article in *The Christian Advocate* provided details of some of the various tests administered:

A smaller treadmill can be speeded up for exhaustion tests. It is also used for psycho-motor checking while the men walk. For instance, the men try to guide a stylus through a maze without touching the sides and another device records their reaction time to signal lights. They take tapping tests to determine muscular coordination. The ataximeter measures body sway or sense of balance. Another gadget—and incidentally, many of them have been invented by experimenters here in the laboratory—will determine the angle of vision (17).

Despite the challenges of starvation, there was a determination among the men that somehow kept them committed. When each was asked if he had ever considered withdrawing, the reply was repeatedly firm and succinct: "No." Harold Blickenstaff recalled:

I had just decided that this was what I was going to do and so I was going to do it . . . and so I would say walking by a bakery was like walking by a bank. It might be nice to have what's in there, but it's out of the question. I never debated whether or not I should break diet or do anything else.

Daniel Peacock suggested that there was a religious element in their dedication: ". . . the experiment kind of became our religion in a way. And we were keeping the faith with that. And that was a pretty big job. So I think it would be fair to say that during that year that experiment was almost our religion. That's what we were dedicated to." Marshall Sutton found a certain kind of discipline in the stress that helped him to get through the experiment: "I worked on keeping a discipline every day of some reading, and just sitting in silence, and it fitted in my state of being." Both Max Kampleman and Roscoe

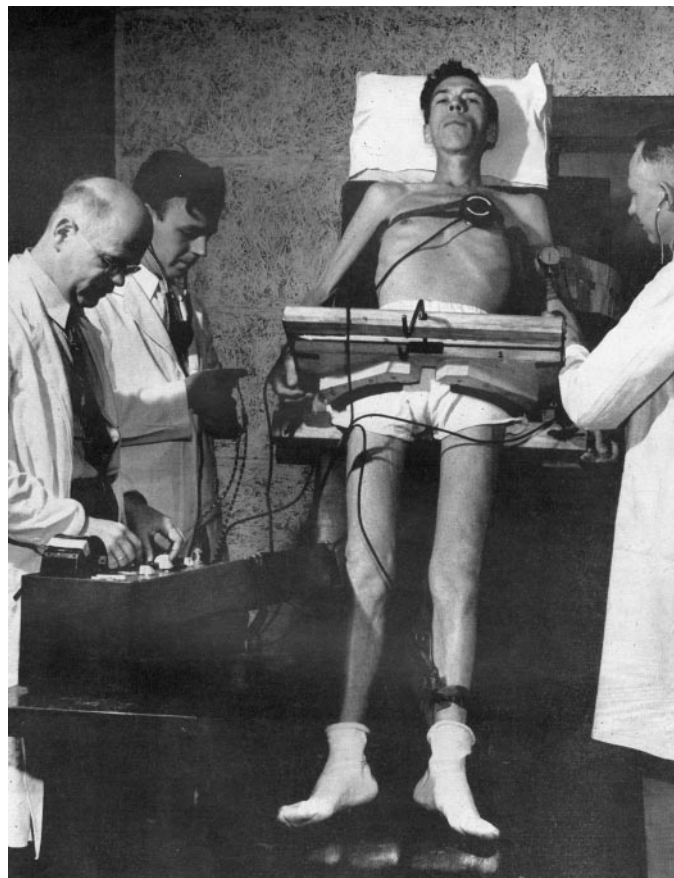


FIGURE 3 *Life* magazine photograph of conscientious objector being examined on a tilting table during starvation experiment. July 30, 1945. Volume 19, Number 5, p. 45. Credit: Wallace Kirkland/Time Life Pictures/Getty Images.

Hinkle suggested that the relatively extensive coursework they took at the university provided them with a distraction that facilitated their commitment. Dan Miller was more succinct: "Damn it, it was will power! Don't try to fuzz it up with something else."

The 3-mo rehabilitation period began at the end of July 1945 and continued until October 20, 1945. With VE Day in Europe on May 8, 1945, and the Japanese surrender on August 14, 1945, the results of the experiment were becoming increasingly relevant. Several of the men, like Earl Heckman, expressed disappointment that the results were not available in a more timely manner: "We had hoped to have an effect on the world hunger situation following the war . . . [but] the experiment was a little late." Although the complete monograph was not published until 1950, Keys released early results related to the most effective of the various rehabilitation diets before the experiment even ended (18,19). At a conference in Chicago in 1945, Keys noted:

Enough food must be supplied to allow tissues destroyed during starvation to be rebuilt . . . our experiments have shown that in an adult man no appreciable rehabilitation can take place on a diet of 2000 calories [actually 2000 kcal (8368 kJ)] a day. The proper level is more like 4000 [4000 kcal (16,736 kJ)] daily for some months. The character of the rehabilitation diet is important also, but unless calories are abundant, then extra proteins, vitamins and minerals are of little value (20).

Keys also stressed the dramatic effect that starvation had on mental attitude and personality, and argued that democracy and nation building would not be possible in a population that did not have access to sufficient food. Information from the experiment was shared with various national and international organizations and the military as they worked to develop a postwar relief plan.

For some, the rehabilitation period proved the most difficult part of the experiment. Many were surprised when they initially lost additional weight after being provided a bit more food, a result of losing the excess edema fluid in their bodies. Charles Smith remembered dropping to 99 lb (45 kg), a difference of >50 lb (22.7 kg) from his weight at the beginning of the semistarvation period. Although Harold Blickenstaff remained slightly above the 100-lb (45.3 kg) mark, he referred to himself as a "ninety pound weakling." William Anderson reported that in many ways rehabilitation was "no better" than the semistarvation period, partially because there was not a noticeable relief from feelings of hunger. Roscoe Hinkle noted that the rehabilitation period ". . . turned out to be worse for me than anything else . . . I had troubles because I didn't really feel that I was coming back at all." Initially the lowest energy group received 2200 kcal (9205 kJ), only about 400 kcal (1674 kJ) more than in semistarvation, but Keys eventually increased this number when the men were not showing marked signs of improvement. The men reported that reduced dizziness, apathy, and lethargy were the first signs of recovery, but that feelings of tiredness, loss of sex drive, and weakness were slow to improve (3). Robert McCullagh noted that he could tell he was beginning to recover when his sense of humor finally returned.

None of the men remembered being provided with detailed instructions for recommended diet or activities after they left, and all agreed that they were not "back to normal" after the 3-mo rehabilitation period. Although they were warned to be careful not to overeat on d 1, they were free to eat as they wished. Henry Scholberg remembered being taken to the hospital to have his stomach pumped because he "just simply overdid." Harold Blickenstaff was sick on the bus on the way back from one of the several meals he had d 1; he found that

he simply ". . . couldn't satisfy [his] craving for food by filling up [his] stomach." Many also reported eating excessively after they left Minnesota; Jasper Garner described it as a "year-long cavity" that needed to be filled. Many, like Roscoe Hinkle, put on substantial weight: "Boy did I add weight. Well, that was flab. You don't have muscle yet. And get[ting] the muscle back again, boy that's no fun." Estimates for how long it took to fully recover ranged from 2 mo to 2 y, but none of the men believed there were any negative long-term health effects from participation. There were some suggestions that Lester Glick had expressed resentment about having developed tuberculosis at the end of the rehabilitation period, but his obituary in 2003 noted: "During WWII he was in the alternative service for conscientious objectors . . . serving as a subject for a groundbreaking University of Minnesota starvation experiment" (21).

Ultimately, data from 32 of the 36 participants were included in the final monograph and tables. Two volunteers broke diet and were excused from the experiment; one stopped at various shops for sundaes and malted milks and later stole and ate several raw rutabagas and the other consumed huge amounts of gum and admitted to eating scraps of food from garbage cans. Both also suffered severe psychological distress during the semistarvation period, resulting in brief stays in the psychiatric ward of the university hospital. Another participant broke diet and later suffered some urological complications that prevented his data from being included, but he was asked to stay on and help in the kitchen. Initially the participants were allowed to chew gum, but some of the men began chewing up to 40 packages/d. One of the participants was later excluded because his pattern of weight loss was not consistent with the amount of food intake and energy expenditure, and there was concern raised about excessive gum chewing.

When specifically asked to reflect on how the experiment was explained to them and how they were treated throughout, several pointed out that recruitment information for the experiment and the descriptions provided by the scientists during the selection interviews stressed the difficulty of the proposed endeavor. Max Kampelman noted:

They explained what was going to happen. There was nothing held back. They explained that they could not assure me that there would be no permanent damage . . . They did not know what would happen. This is what they were trying to find out . . . really they emphasized the discomfort . . . this was not going to be an easy task down the road.

Most also spoke of a feeling of medical safety throughout the experiment. Robert McCullagh noted, "I knew that they were keeping track of me and that nothing was going to happen to me physically." Charles Smith felt secure due to the: ". . . very high levels of professional responsibility . . . there was no physical threat to one's long-term survival because you were surrounded by experts who were watching you very closely." At times, the men seemed almost apologetic about the relative medical safety, wanting to make clear that they distinguished their hunger from that of those starving in unmonitored environments. Samuel Legg's concluding comment related to this issue: "The difference between us and the people we were trying to serve: they probably had less food than we did. We were starving under the best possible medical conditions. And most of all, we knew the exact day on which our torture was going to end. None of that was true of people in Belgium, the Netherlands, or whatever."

Participants remembered Keys for his professionalism, always in his white coat with notebook in hand and sparing with conversation. The men were both reassured by his presence and expressed that they felt safe in his hands. Marshall Sutton

commented that the university accepted the conscientious objectors and the project “because Ancel Keys accepted [them].” Richard Mundy suggested that perhaps Keys and the staff, upon seeing the dramatic physical effect of starvation, had more ethical concerns about the experiment than the participants themselves: “Mrs. Keys said that Dr. Keys went through terrible times during the experiment as we lost weight and became gaunt and so on. And he would come home and say, ‘What am I doing to these young men? I had no idea it was going to be this hard.’” Perhaps the strongest testament to Keys’ leadership is the fact that the participants agreed that if the clocks were turned back, they would again make the same decision to participate, even after having experienced the physical sacrifice required. Although, like Daniel Peacock, most of them added: “Now remember, I’d do it again if I were 24 again!”

After the Minnesota Experiment, many of the participants continued to follow their convictions about peace. Seven of the 18 interviewed participated in Heifers for Relief, a program that delivered livestock shipments to postwar Europe; the men were responsible for cleaning and caring for the animals on boat trips across the Atlantic. From 1948 to 1950, Harold Blickenstaff worked on a transport team in Poland to bring building materials to people whose homes had been destroyed during the war, and participated in international voluntary work camps in Europe. Samuel Legg worked with the American Friends Service Committee to raise money for food to be sent to Germany, and later spent time in France and Switzerland working on various Quaker projects. Marshall Sutton went with the American Friends Service Committee to feed refugees in Gaza in the Middle East, and spent most of his career working on and leading Quaker projects in the United States. Robert McCullagh went to Yale Divinity School and then to campus ministries in California, South Dakota, and Hawaii. Robert Villcock attended the University of Chicago Divinity School and worked in university and parish ministries in the Midwest. William Anderson was ordained a Methodist minister in Mozambique, and spent nearly 30 years working in South Africa, Mozambique, and Kenya. Max Kampelman went on to a career in politics, law, and diplomacy. He headed the U.S. delegations to the Geneva negotiations on nuclear and space arms reductions in 1974 and the Madrid East-West Conference on Human Rights in the early 1980s, and was later appointed vice-chairman for the United States Institute of Peace. Many of the other participants served as distinguished professors and educators. Despite these various accomplishments, the men continued to look back on participation in the Minnesota Experiment as one of the most important and memorable activities in their lives. Wesley Miller reported, “It’s colored my whole life experience . . . [and was] one of the most important things I ever did . . . I’m proud of the work the Civilian Public Service did during the war.” Samuel Legg

seemed to speak for all of the men when he commented, “I think probably most of us are feeling we did something good and are glad we did it, and that helps us live a better life.”

ACKNOWLEDGMENTS

We thank Carolyn Williams for her assistance in locating the contact information for the interviewees, Henry Blackburn for his advice early in the research process, and Kathy Ramel for her help in accessing various articles from the time of the experiment.

LITERATURE CITED

1. Keys, A. (1944) Will You Starve That They Be Better Fed? Brochure dated May 27, 1944.
2. Keys, A. (1990) Recollections of pioneers in nutrition: from starvation to cholesterol. *J. Am. Coll. Nutr.* 9: 288–291.
3. Keys, A., Brozek, J., Henschel, A., Mickelsen, O. & Taylor, H. L. (1950) *The Biology of Human Starvation*, Vols. I–II. University of Minnesota Press, Minneapolis, MN.
4. Guetzkow, H. G. & Bowman, P. H. (1946) *Men and Hunger: A Psychological Manual for Relief Workers*. Brethren Publishing House, Elgin, IL.
5. Tyrka, A. R., Waldron, I., Graber, J. A. & Brooks-Gunn, J. (2002) Prospective predictors of the onset of anorexic and bulimic syndromes. *Int. J. Eating Disord.* 32: 282–90.
6. Williamson, D. A., White, M. A., York-Crowe, E. & Stewart, T. M. (2004) Cognitive-behavioral theories of eating disorders. *Behav. Modif.* 28: 711–738.
7. Garner, D. M. (1997) Psychoeducational principles in the treatment of eating disorders. In: *Handbook for Treatment of Eating Disorders* (Garner, D. M. & Garfinkel, P. E., eds.), pp. 145–177. Guilford Press, New York, NY.
8. Doucet, E., St-Pierre, S., Almeras, N., Despres, J. P., Bouchard, C. & Tremblay, A. (2001) Evidence for the existence of adaptive thermogenesis during weight loss. *Br. J. Nutr.* 85: 715–723.
9. Dulloo, A. G., Jacquet, J. & Montani, J. P. (2002) Pathways from weight fluctuations to metabolic diseases: focus on maladaptive thermogenesis during catch-up fat. *Int. J. Obes. Relat. Metab. Disord.* 26 (suppl. 2): S46–S57.
10. Hoffer, L. J. (2003) Protein and energy provision in critical illness. *Am. J. Clin. Nutr.* 78: 906–911.
11. Kaysen, G. A. (2000) Malnutrition and the acute-phase reaction in dialysis patients—how to measure and how to distinguish. *Nephrol. Dial. Transplant.* 15: 1521–1524.
12. Chang, H. R., Dulloo, A. G. & Bistran, B. R. (1998) Role of cytokines in AIDS wasting. *Nutrition* 14: 853–863.
13. Frazer, H. T. & O’Sullivan, J. (1996) *We Have Just Begun to Not Fight: An Oral History of Conscientious Objectors in Civilian Public Service During World War II*. Twayne, New York, NY.
14. (1945) Men Starve in Minnesota: Conscientious Objectors Volunteer for Strict Hunger Tests to Study Europe’s Food Problem. *Life* 19: 43–46.
15. Quigley, W. (1945) Conchies’ Tests at U Disclose—Many In Europe Must Starve. *St. Paul Dispatch*, July 26, 1945.
16. (1945) Food Dreams Come True: ‘U’ Conchies to Become ‘Regulated Gourmets’. *Minneapolis Star-Journal*. July 26, 1945.
17. (1945) They Starve That Others May Be Fed. *The Christian Advocate* 1945: 788–790.
18. Keys, A., Brozek, J., Henschel, A., Mickelsen, O. & Taylor, H. L. (1945) *Experimental Starvation in Man. A Report from the Laboratory of Physiological Hygiene, University of Minnesota*. University of Minnesota, Minneapolis, MN.
19. Keys, A., Brozek, J., Henschel, A., Mickelsen, O. & Taylor, H. L. (1946) *Rehabilitation Following Experimental Starvation in Man. A Report from the Laboratory of Physiological Hygiene, University of Minnesota*. University of Minnesota, Minneapolis, MN.
20. (1945) ‘U’ Experiment Proves Starved People Can’t Be Taught Democracy. *Minneapolis Star-Journal*. September 26, 1945: 18.
21. (2003) Obituary of Lester J. Glick [Online]. *The Clarion Ledger*, March 2, 2003. <http://www.clarionledger.com/news/miss/deaths/2003030207.html> [accessed July 3, 2003].