Case 22.—Male aged 35. Transverse fracture with separation. Patella removed; sutured with silk. Examined 10 years later says he is working all day and would not know that anything was the matter with his knee. By occupation he is a labourer. On examination there was no deformity, weakness, or limitation of full extension or other movement. Skiagram: No O.A. changes. He demonstrated that he could run upstairs.

Case 23.—Male aged 45. Transverse fracture of patella 7 years ago, sutured with thread. He has worked all the time as a labourer. No difference between the two limbs could now be detected. Skiagram: No O.A. changes.

Case 24.—Male aged 22. Transverse fracture of patella previously wired, with breaking of wire. Wire and bone removed; sutured with silk 10 years ago. There is no deformity and only slight impairment of function. Flexion limited 20%; extension full; some weakness. Skiagram: No O.A. changes. He has been in an Infantry regiment since the beginning of the war. Has served in Egypt and Italy, and his category is A1.

Case 25.—Female aged 50. Stellate fracture 5 years ago; removal; suture with thread. Extension full; walks upstairs well. Says that knee is as well as before the operation. No deformity. Does all her own housework.

Case 26.—Male aged 38. Transverse fracture left patella, excised 7 years ago. Before the war worked in an office. Was passed A1 into Army and has served abroad during whole of war. Has never had a moment's trouble with the knee, and has seen some hard fighting. No difference between the two knees could be detected. Skiagram: No O.A. changes.

Case 27.—Male aged 34. Comminuted fracture right patella 10 years ago. Interval closed with silk. By occupation a carpenter, he resumed work in four weeks and has served through the war—Category A1. He says that he cannot distinguish any difference between the two limbs. He can run upstairs with ease. Extension is full. Skiagram shows a few spicules of bone in the extensor tendon, but no O.A. changes.

Case 28.—A labourer aged 51. Sustained a stellate fracture of the left patella 7 years ago. He returned to work six weeks after operation and has worked ever since. The patient notices no difference between the two sides. Power good; no deformity or limitation of extension; no symptoms. Can run upstairs. Skiagram: No O.A. changes.

Case 29.—Male aged 41, a builder's labourer. Sustained a comminuted fracture of the patella. Removed 8 years ago; interval closed with fascia. Returned to work 3 weeks after the operation. No difference can now be detected in the two limbs. The patient says that, if anything, he believes that the affected limb is stronger than the other. Thus, when working on a ladder he can stand on the affected side without tiring for a longer time than on the normal side. Skiagram shows no O.A. changes.

Cases Examined by Means of Written Questionary

Case 30.—An Army officer aged 37. Transverse fracture of patella; removed 11 years ago. Away from work for 6 weeks. The knee is better than before the operation. No weakness; extension full. Can run upstairs. Knee does not look unsightly. Patient remarks: "I have played Rugby football and other games and swum a great deal without any trouble." Spent 3 years on active service abroad. Army Medical Category A1.

Case 31.—A sapper aged 33. Transverse fracture operation 11 years ago. Away from work 6 weeks. Can do present work. Knee is the same as before the operation. Can notice no difference between the two knees. No weakness, but damp weather makes the injured knee ache. Extension full. Can run upstairs. Knee does not look unsightly. Patient remarks: "It has stood up to all the Army training and sports, and I still play football." Army Medical Category A1.

Case 32.—Male aged 46. Comminuted fracture; removed 7 years ago; sutured with thread. Away from work 4 weeks. Can do present work driving 6-ton lorry. Can notice no difference from before the operation. Knee is flat to look at. No weakness; extension full. Can run upstairs. Knee does not look unsightly. Patient's statement: "The knee, in my opinion, is very satisfactory, causing me no trouble in any way, being able to do my work, which consists of climbing and jumping all the time."

Case 33.—Male aged 32, builder's labourer. Stellate fracture. Operation 13 years ago. Returned to work in 12 weeks. Knee is the same as before the operation. Can notice no difference between the two knees. No weakness; extension full. Can run upstairs—does ladder work. Knee does not look unsightly. Patient says: "I have forgotten all about the operation. I do a lot of cycling and feel no pain at all."

Case 34.—Male aged 45. Stellate fracture; removed 5 years ago. Staff officer B.A.O.R. Knee same as before operation, but with slight weakness. Extension full. Can walk upstairs, but cannot run. Personal statement: "For all normal purposes the knee is

satisfactory, but not for games. If I have to be on my feet for long periods the knee aches."

Case 35.—Female aged 45. Stellate fracture; operation 5 years ago. Cannot do housework. Knee is worse than before operation, and is weak. Extension not full. Cannot run upstairs. Knee looks flat. Personal statement: "The knee lets me down without warning. There is also wasting of the leg above the knee and swelling at times."

Three patients have since died: of these, two were males. Two fractures were transverse, one comminuted. In two cases (both transverse fractures and males) both were at work until their death. One of these was the window-cleaner who was killed by a bomb while up a ladder.

No reply was received from 16 patients—5 transverse fractures and 11 stellate fractures.

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VITAMIN C CONTENT OF HOME-COOKED VEGETABLES

BY

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Much attention has recently been focused on the level of vitamin C intake among various groups of the population. This work has taken the form of analysis of various types of canteen meals (Booth *et al.*, 1942), calculation of intakes by the study of menus (Widdowson and McCance, 1942), vitamin C saturation tests (Wormall and Francis, 1942), and controlled laboratory tests on cooking (Olliver, 1940, 1941, 1943). Harris and Olliver (1943) investigated by chemical analysis the vitamin C intake at a small residential home, but I am not aware of any attempt having been made to measure directly the vitamin C content of meals cooked at home by ordinary domestic methods. The chief aim of the present work was to investigate by direct analysis the vitamin C content of samples of home-cooked vegetables and the losses incurred during cooking. Since there has been much controversy about the feasibility of calculating the vitamin C content of vegetables from tables of raw values and from details of cooking methods employed, information about the timing and method of cooking was obtained for most of the samples. It was therefore possible to calculate the vitamin C content for each sample, and to compare the calculated and determined values.

This paper describes three surveys—one carried out in a university town, and two in northern industrial cities. Most of the samples were collected by field workers of the Wartime Social Survey, who were making a dietary inquiry for the Ministry of Health and the local school medical officers, and who also obtained information on the methods of preparation and cooking of the vegetables. The samples came from households of widely varying income, and each set of samples (e.g., potato, cabbage, and gravy) were from a different household.

Method

Weighed dark-green glass bottles containing 50 c.cm. of 20% metaphosphoric acid were taken to the housewives by the field workers, who had been given instructions for obtaining representative samples of potatoes and green and root vegetables. The samples were collected only while the meal was being eaten. The bottles were returned to the laboratory, re-weighed, and the contents extracted and estimated, usually the same day or not later than the next day, by the method of Harris and Olliver (1942). The housewife was asked for details of (a) the method of preparation (quartered, halved, or shredded); (b) the cooking of green vegetables (amount of water used, whether the vegetable was a quarter, half, or completely covered); and (c) the duration of keeping hot after cooking or of reheating. For potatoes and root vegetables the inquiries covered the length of time of keeping hot and of reheating, and whether or not the vegetables had been mashed.

Samples of gravy were taken in some cases when cooking-water had been used in its preparation. From data obtained in this way and from the results of the experiments of Allen and Mapson (1944), Olliver (1941), and Jenkins (unpublished), the vitamin C contents of the vegetables were calculated.

The most accurate method of estimating the influence of the volume of cooking-water on the vitamin C content of green vegetables is to weigh the cooked vegetable and measure the volume of the water *after* cooking. It was not possible to make these measurements in the present survey, and a less accurate method had to be adopted—namely, to judge whether the vegetable was a quarter, half, or completely covered by the cooking-water. This is not wholly satisfactory, since the important ratio is the final volume of water to the weight of cooked vegetable, and this will vary with the size of saucepans even when the degree of covering is kept constant. Assuming that the pan is of a size conveniently filled by the vegetable, then the volumes of water necessary to cover the vegetable completely, half, or quarter would, according to calculations, permit retentions of the order of 20, 40, and 60% of the vitamin C content of the raw vegetable. The loss during keeping hot or reheating of green vegetable was judged from the experiments to be 50% per hour. No account was taken of whether the greens were placed in cold water and gradually brought to boiling point, or were plunged directly into boiling water, as this factor does not appear to be important in affecting the vitamin C loss in cooking on the domestic scale (Jenkins, unpublished), but it is important when large amounts of vegetables are being cooked (Macrae, 1944). In the case of root vegetables, oxidation and extraction during boiling were assumed, on the basis of the experiments mentioned above, to cause a fall to 50% of the raw value, with further destruction at the rate of 50% per hour if kept hot, unless the vegetables had been mashed, when the rate of destruction was about three times greater (Jenkins, 1943; Lampitt *et al.*, 1943).

The average vitamin C content of the raw potatoes available at the time of the survey was found by analysing a number of pooled samples obtained from several shops in the districts. The values found (mg./100 g.) were 20 in September and 9 in April. No value for raw green vegetables was obtained, as it was not possible to collect and estimate a sufficiently large number of raw samples to make the result significant for so variable a vegetable as cabbage. A value of 70 mg. per 100 g. was taken as the average value for raw cabbage (Olliver, 1943). The average calculated values are given in Table II.

Results

The results are divided into three parts—first, a small-scale survey carried out in the winter of 1942–3; secondly, 200 samples collected in the industrial cities in Sept., 1943; and, finally, 100 samples from the same cities in April, 1944. Some of the analyses of samples collected during April were carried out by Dr. L. P. Kendal, who has kindly allowed me to quote his results.

The results of the analyses are set out in Tables I and II. The figures obtained for gravies were often anomalous in that

TABLE I.—Results Obtained in Preliminary Survey; Winter, 1942–3

	Nov./Dec., 1942				Jan./Feb., 1943			
	No. of Samples	Vitamin C (mg./100 g.)			No. of Samples	Vitamin C (mg./100 g.)		
		Average	Range			Average	Range	
Potatoes	12	10.5	8–16	9	6	3–8		
Cabbage	5	22	13–47	1	11	—		
Brussels sprouts ..	4	50	39–68	7	29	17–41		

their vitamin C content exceeded that of the vegetable water from which they were prepared, indicating the presence of reducing substances other than vitamin C, formed during cooking, which interfere with the estimation (Mapson, 1943). Since the method of assaying vitamin C separately from these substances is time-consuming it was not possible to apply it, and the results obtained on gravies have not been quoted. A few samples of other vegetables (e.g., swedes and onions) were analysed, but the numbers were too small to justify publication.

TABLE II.—Found and Calculated Vitamin C Values from Industrial Cities

	September, 1943						April, 1944					
	No. of Samples	Vitamin C (mg./100 g.)					No. of Samples	Vitamin C (mg./100 g.)				
		Av.	Range	Av.	Range			Av.	Range	Av.	Range	
Potatoes ..	77	10.5	2–26	10.5	2–15		50	5	1–10	4.5	1–5	
Cabbage ..	30	13	3–38	17.0	2–42		14	35	7–63	25	14–42	
Carrot ..	14	3	2–5	—	—		12	2	0.5–5	—	—	
Runner beans	9	5	2–11	—	—		—	—	—	—	—	
Cauliflower	6	12	3–28	—	—		6	37	11–67	—	—	

Discussion

The first survey of 1942–3 was on so small a scale that by itself no significance could be attached to the results; but the figures suggested that the losses of vitamin C during cooking, in these homes, were not excessive. Forty samples were taken from 21 meals, and, assuming that each meal contained 150 g. of potato and 100 g. of the second vegetable, which are reasonable helpings, all but eight of them provided 30 mg. of vitamin C—that is, the daily requirement suggested by the League of Nations Commission—and, of these eight, only four provided less than 24 mg. Cooking loss was responsible for the low vitamin C in only one of these meals; in another meal the second vegetable was carrots (providing only 2 mg.), and the other two contained no vegetable other than potato. The average content per meal was 43 mg. for November/December and 33 for January/February.

Many of the housewives who provided samples in the two larger surveys had completely covered their green vegetables with water and therefore increased the proportion of soluble nutrients extracted during cooking. A few housewives followed the Ministry of Food's instructions for cooking greens, with the result that their product contained about three times as much vitamin C as the general average. The finding that the vitamin C content of cooked cabbage in spring (35 mg./100 g.) was so much greater than in autumn (13 mg./100 g.) is unexpected, and is probably fortuitous, as only 14 samples were collected in April.

Using the figures obtained in the larger survey, a typical meal, containing potato and greens, was estimated to provide about 28 mg. of vitamin C in September and not less than 20 in April. If the second vegetable were carrots, or if, as sometimes occurred, no second vegetable were served, then the meal would provide only about 15 mg. in September and 7 or 8 mg. in April. These amounts of vitamin C were probably the total day's intake in most families, as typical wartime breakfasts and teas contribute little or no vitamin C. It would seem that propaganda aiming at increasing vitamin C intake should place as much stress on the importance of including green vegetables in meals as on methods of reducing cooking losses.

Many households did not have a cooked meal at home, as all members of the family received a canteen or British Restaurant meal, the vitamin C content of which tends to be low.

Comparison of Found and Calculated Values

Comparison of *average* vitamin C values of the vegetables, as determined by analysis, with those obtained by calculation shows remarkably good agreement for potatoes and fair for cabbage (Table II). The correlation between calculated and determined values for *individual* samples is, however, low but significant ($r=0.52$ for 38 samples of cabbage; 0.39 for 58 samples of potato in September and 0.59 for 46 samples in March; P is less than 0.01 in all cases). The data collected in this survey therefore indicate that it is not possible to calculate the precise vitamin C content of an individual meal, but that the averages of figures so obtained are in close agreement.

Although it appears not to be possible to calculate accurately the vitamin C content of a meal it is possible with most meals to say whether it is very low or very high. When calculations indicated that a meal contained, say, less than 10 or more than 30 mg. of vitamin C, the analysis usually confirmed this general grouping, but there were many discrep-

ancies. It would seem, therefore, undesirable to place much reliance on calculations of the vitamin C content of individual meals unless one obtains detailed and accurate information on the method of cooking (Jenkins *et al.*, 1945).

Summary

The vitamin C contents of over 300 samples of vegetables cooked in ordinary households were determined in 1943-4, and the main average results were: (mg./100 g.) potatoes (September) 10.5, (April) 5; cabbage (September) 13, (April) 35. Average meals containing potatoes and greens provided between 20 and 28 mg. of vitamin C, according to season. Average meals containing no green vegetables provided less than 15 mg. vitamin C in September and less than 8 in April. The correlation between vitamin C values as analysed and those calculated from information about the methods of cooking employed was poor in individual cases, but the average agreed fairly well, especially with potatoes.

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NEUROLOGICAL COMPLICATIONS FOLLOWING PREFRONTAL LEUCOTOMY

BY

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As an increasing number of prefrontal leucotomy operations are performed and various techniques are employed, the question constantly arises how far posteriorly one should operate to achieve the maximum mental amelioration. Meyer and Beck (1945), studying necropsy material, advised against section at a posterior level, and Knight (1943) came to a similar conclusion when performing the operation further back than 3 cm. behind the orbit. The case reported here is of neurological interest and sheds further light on the above problem.

Case Record

A woman aged 27 was admitted to Netherne Hospital, Coudsdon, on Oct. 3, 1944, as a case of schizophrenia. In this attack, a few days before her admission, she started to behave strangely, talked about her eyesight, and was worried that she might become blind. On examination she answered questions monosyllabically and in "telegram style." She giggled and grimaced, neglected herself, and was faulty in her habits. Physically she did not show any signs of active disorder, but had a slightly deformed right foot. After a short observation period she received a course of electric convulsion therapy, resulting in some improvement, and was taken home by her parents against advice. In a few days, however, she was readmitted. She was then obviously hallucinated, shouted "Don't hit me," "She is not there," etc., but otherwise her speech was incoherent. She was agitated, restless, excitable, and negativistic; she grimaced, giggled, was completely lost to her environment, and was unclean in her habits. Convulsion therapy was repeated, but as soon as the intensive treatment terminated she relapsed into an excited state again.

She comes of a poor stock. She was average at school and rather shy. After schooling, at the age of 15 she had a transient "nervous state," when she was full of worries about her eyesight; though she recovered and did domestic work she had been "odd and peculiar" since her first attack. She was redirected to N.A.A.F.I. a few weeks before her first admission.

In this case, instead of any further shock treatment, leucotomy was considered. On Aug. 22, 1945, a bilateral horizontal prefrontal leucotomy was performed (Mr. E. J. Radley-Smith) using a MacGregor-Crumble leucotome. The usual technique is to insert the instrument at a point 3 cm. behind the external angular process and 3 cm. above the zygoma, having first identified the Sylvian

fissure. This approach can be used for either a horizontal or a vertical section by pointing the instrument in the appropriate direction and making the incision in the required plane. In this case the leucotome was directed towards a point 1 cm. above and 2 cm. behind the supraorbital notch and the section made horizontally; it was thought that by this technique one is able to cut more posteriorly than at our usually performed operations. There was no unusual degree of intracerebral haemorrhage during the operation.

The morning after the operation she was fully conscious, orientated, but had a fine Parkinsonian tremor in the left hand with "pill-rolling" movements. There was no difference in tone in the arms or legs, and the deep reflexes in all four extremities were equal. Abdominal reflexes were present in all four quadrants, and the plantar responses were flexor. She was incontinent. To avoid disturbing her in her post-operative state no further neurological examination was carried out. The same clinical picture prevailed for the next three days, and the tremor of the left hand was occasionally accompanied by tremor of the left foot. On the fourth post-operative day she regained sphincter control, the tremor subsided, leaving some clumsiness of the left hand, and she had an upgoing toe on the left side. Mentally she was apathetic.

On the seventh post-operative day she showed a definite weakness of the left arm and hand. Deep reflexes: L. > R., with a left Babinski. On the eighth post-operative day she developed the following neurological signs and symptoms, localized to the left side: tendency to fall to the left, loss of postural sensibility, dysmetria, and failure in past pointing of the left arm. There was a loss of pinprick sensation over the lower half of the left arm, and a moderate astereognosis—not being able, with her eyes closed, to name objects placed into her left hand. The tonus of the left arm was decreased, but the reflexes were increased on the left arm as well as on the left leg. Abdominal reflexes were present; the upgoing toe at the left side persisted. There was also apraxia, and she could not use the scissors, a pen, a brush, keys, or a lighter with her left hand. After two days the condition became more severe; in addition to the above symptoms, weakness of the left arm became more pronounced, and left facial weakness developed, with loss of the blinking reflex. No general signs of increased intracranial pressure were present. The next few days showed rapid improvement of her condition, and on the 17th post-operative day she had no facial weakness, very slight weakness of the arm, no apraxia, no upgoing toe, but the left abdominal reflexes were absent. She became cheerful, talked spontaneously about her plans for the future, did not grimace, and did not indulge in sudden and incongruous laughter and giggling. She did not know what happened to her arm and was indifferent to the fact that her hair was shaved off. She occupied herself with knitting, but showed marked perseveration in her actions; she was unable to stop any movements she started—e.g., if asked to make a knot she went on making knots, and did not stop until she was commanded definitely to do so. Perseveration was also noticeable when she was asked to copy a geometrical figure from memory. The next five days brought further mental amelioration; she worked in the occupational department, and was pleasant and co-operative. Neurologically no sign other than a very slight clumsiness of her left hand and arm, and very slightly increased tendon reflexes of the left arm and loss of left abdominal reflexes, remained permanently. On Sept. 18, 1945, she became restless and negativistic, and on the following day did not return to the occupational department.

Her mental condition progressively deteriorated. On Sept. 22 she was lying in bed, keeping under the bedclothes, actively hallucinated. When spoken to she giggled and gave bizarre answers, making statements that the medical officer was her father. In the next fourteen days such autistically inclined hallucinatory states alternated with outbursts of sudden aggression, when she hit the ward sister and attacked other patients. At the time of reporting—Nov. 21, 1945—there is but little improvement in her mental condition in comparison with the pre-operative state. She is more apathetic than dissociated, and is granted short leaves of absence from the hospital. She is gaining weight rapidly.

(Since this report was written the patient has made a progressive improvement and been discharged from hospital.)

Commentary

The probable clinical evaluation of the case is that on the right side the operative incision was accompanied by an oedema or perhaps by bleeding. The developing neurological signs and symptoms made it possible to locate the induced lesion, which probably affected partly the striate body (tremor), partly the radiation of the callosal body (apraxia and apathy), and encroached upon the anterior limb of the internal capsule (weakness of upper limb and reflex changes). The perseveration, according to Freeman and Watts (1942), indicates that "too much of the frontal lobes have been sacrificed." As the oedema subsided the comparatively slight neurological symptoms, as the result of the operation, became evident. Although the