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Surveillance of small round structured virus (SRSV) infection in England and Wales, 1990–5

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SUMMARY

Data from the national surveillance scheme for general outbreaks of intestinal disease, and the national laboratory reporting scheme were used to describe the epidemiology of small round structured virus (SRSV) infections in England and Wales. Between 1990 and 1995, there were 7492 laboratory reports of SRSV. Rates of reported illness were highest among infants, young children and the elderly. During 1992–5, some 707 SRSV outbreaks were reported. Outbreaks in hospital wards and residential facilities for the elderly accounted for 76% of the total, and annual numbers increased more than sixfold over the study period. There were wide regional variations in the numbers of SRSV outbreaks and laboratory reports. Both sporadic cases and outbreaks in the community are likely to be underestimated, but these passive surveillance systems provide an insight into the burden of SRSV infection among the institutionalized elderly.

INTRODUCTION

Although John Zahorsky described 'winter vomiting disease' in 1929 [1], it wasn't until 1972 that Norwalk virus was first reported as a cause of non-bacterial gastro-enteritis [2]. Later, other viruses with similar features were designated Norwalk-like viruses and named after the places where they were isolated [3, 4]. In 1982, the term small round structured virus (SRSV) was adopted in an interim classification [5], and SRSVs have subsequently been formally classified within the family of *Caliciviridae* [6–8].

In the group of viral agents of gastro-enteritis which also includes rotaviruses, adenoviruses, 'classical' human caliciviruses and astroviruses [9, 10], SRSVs have been recognized as a major cause of outbreaks of nonbacterial gastro-enteritis [11]. SRSV infection is associated with a generally mild, self-limiting illness, characterized by vomiting, diarrhoea, abdominal cramps and nausea, which usually last 48–72 h [12–14]. Kaplan and colleagues defined clinical and epidemiological criteria for outbreaks which together were strongly predictive of SRSV infection [15], but confirmation of SRSV infection requires examination of faeces by electron microscopy (EM), and the sensitivity of the method can be improved using solid phase immune electron microscopy (SPIEM) [8, 13].

Community sporadic cases and outbreaks occur via foodborne and/or person-to-person transmission of SRSV through the faecal-oral route or mechanical transmission from surfaces contaminated by vomit [11, 13, 14]. Exposure to aerosilized vomit has been suggested to account for secondary cases in some outbreaks [16–19]. Food contaminated by food workers [14, 20, 21], and contaminated water supplies have also been incriminated in outbreaks [10, 11, 14].

In England and Wales, information on individual

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SRSV infections is available through the national laboratory reporting scheme [22]. More recently a surveillance system for outbreaks of infectious intestinal disease was introduced, which complements the information from laboratory confirmed infection [23]. Numbers of SRSV laboratory reports and outbreaks have increased steadily in recent years although there have not been any accompanying change in methods of diagnosis [24]. This report utilizes data from the two surveillance systems to describe trends and epidemiological features of SRSV infection in England and Wales over the period 1990–5, and to investigate whether the observed increase was restricted to certain population groups or outbreak settings, or was a more general phenomenon.

METHODS

National laboratory reporting scheme

The Communicable Disease Surveillance Centre (CDSC) operates a scheme whereby the Public Health Laboratory Service (PHLS), National Health Service (NHS), and some private hospital microbiology laboratories in England and Wales report positive diagnostic test results, including SRSV identifications, to CDSC each week [22].

For SRSV infection, EM is the only method currently used in routine diagnostic laboratories in England and Wales. Most laboratories refer specimens to specialist EM units within other laboratories, although reporting of results to CDSC is the responsibility of the source laboratory. Twelve PHLS laboratories currently provide EM facilities for diagnosis of SRSV infection, and a questionnaire-based telephone survey of these laboratories was conducted in August 1996 in order to obtain information on policies and practices used for the diagnosis of SRSV infection in PHLS laboratories. Electron microscopy diagnosis of cases of acute non-bacterial gastroenteritis is principally used as an outbreak investigative tool in adults and older children, while sporadic cases are generally investigated only if they occur in young children and usually only after examination by rotavirus-specific enzyme immunoassays [25].

All SRSV identifications reported up to June 1996, and from specimens taken during January 1990–December 1995 were selected for analysis. The main data items were age and sex of patient, date of specimen collection and Regional Health Authority (RHA) of source laboratory. Rates of reported illness were calculated using mid-year population estimates from the Office for National Statistics.

National surveillance scheme for outbreaks

On 1 January 1992, in addition to the national laboratory reporting scheme, CDSC introduced a new system for the surveillance of general outbreaks of infectious intestinal diseases in England and Wales [23], in response to a recommendation by the Committee on the Microbiological Safety of Food (Richmond Committee) [26].

This scheme is based on a standard questionnaire which is dispatched to the appropriate Consultant in Communicable Disease Control (CCDC) with the request that the form be completed by the lead investigator on completion of the outbreak investigation. The questionnaire seeks a minimum set of data on all outbreaks, including details of the setting in which the outbreak occurred, the principle mode of transmission, causative organism and details of laboratory and epidemiological investigations [23]. Information from the questionnaires is stored in a database using the computer package Epi-Info [27].

An outbreak is defined as an incident in which two or more people, thought to have a common exposure, experience a similar illness or proven infection (at least one of them being ill). Only those affecting members of more than one private residence, or residents of an institution are reported in this system. These are termed general outbreaks, but are referred to simply as outbreaks in this paper. An outbreak of gastrointestinal infection is considered to be due to SRSV infection if the agent was identified in a faecal specimen from at least one affected person and if no other pathogen was identified. At the beginning of 1995, PHLS EM units were asked by CDSC to provide details of any outbreaks of gastrointestinal disease for which they provided reference facilities. This allowed CDSC to identify and obtain additional standardized data on outbreaks that were investigated, but may not have been reported.

Small round structured virus outbreaks which occurred between 1 January 1992 and 31 December 1995 were selected for analysis. Factors analysed included date of occurrence of first and last case, settings, geographical distribution according to the Regional Health Authority (RHA) of the source laboratory, suspected route of transmission, attack rates, morbidity and mortality, food vehicles and

contributing factors. No information about the gender and age of the individuals affected or on secondary attack rates was available. Information on symptoms, duration of illness and incubation period were available for outbreaks reported during 1992–4 only.

RESULTS

Between 1990 and the end of June 1996, a total of 7492 laboratory reports of SRSV infection were received at CDSC from specimens collected between 1990 and 1995. The number of reports increased from 444 in 1990 to 2344 in 1995, while the number of reporting laboratories increased from 65 in 1990 to 111 in 1995 (Table 1). Of the 5806 reports for which the age of the patient was known, 36% came from children under 5 years, 20% from persons aged 5–64 years, and 44% from persons aged 65 years or over. Rates of reported illness were highest for infants, young children, and the elderly, and were uniformly low for ages 5–64 years. The rate for females was lower than for males among under 5 years old, but higher than for males in persons over 75 years. A total of 707 SRSV outbreaks were reported to CDSC in which the first case occurred during 1992–5. At least 22123 persons were affected and 17 deaths were reported in 16 outbreaks, all in hospital geriatric wards or residential facilities for the elderly.

In 1992, SRSV accounted for 18% of all outbreaks reported to the surveillance system, and this proportion increased to 47% in 1995 (data not shown). SRSV outbreaks in hospitals and residential facilities for the elderly increased more than sixfold during this period and together accounted for almost 76% of all SRSV outbreaks (Table 2). Outbreaks involving commercial food outlets increased less than threefold and accounted for 14% of all SRSV outbreaks. Outbreak questionnaires were returned by consultants in communicable disease control (CCDCs, 31%), environmental health officers (EHOs, 22%), microbiologists (18%), nurses (12%), public health department staff (6%), hospital control of infection staff (5%) and others (6%). Hospital outbreaks were reported mainly by microbiologists (42%), nurses (23%), and CCDCs (15%); outbreaks in residential homes, food outlets, schools and other sites were reported mainly by CCDCs (41%) and EHOs (36%).

SRSV infection was confirmed in an average of 3·1 persons per outbreak, with a median of two (range 1–36). Specimens for microbiological examination were taken from an estimated 42·4% of affected

Table 1. *Annual numbers and rates* of SRSV laboratory reports by age group and sex, and number of reporting laboratories: England and Wales, 1990–5*

	1990		1991		1992		1993		1994		1995		Total	Mean annual rate (1990–5)		
	n	Rate	*n*	Rate	*n*	Rate	*n*	Rate	*n*	Rate	*n*	Rate	1990–5	Persons	Males	Females
Laboratory reports																
Age group																
< 1 yr	102	149	169	241	134	193	210	314	203	303	136	209	954	234	251	208
1–4 yr	73	27	124	45	176	64	220	80	335	122	215	79	1143	70	74	63
5–14 yr	16	3	14	2	26	4	27	4	40	6	29	4	152	4	4	4
15–64 yr	69	2	76	2	103	3	188	6	231	7	342	10	1009	5	4	6
65–74 yr	23	5	33	7	33	7	56	12	98	21	148	32	391	14	14	15
75 and over	71	20	152	42	182	50	362	101	446	125	944	256	2157	100	78	110
Not known	90		189		176		361		340		530		1686			
All ages	444	9	757	15	830	16	1424	28	1693	33	2344	45	7492	24	19	28
Number of reporting laboratories	65		81		76		92		104		111		—			

* Rate per million population.

Table 2. *Annual numbers of SRSV outbreaks by site: England and Wales, 1992–5**

	1992		1993		1994		1995		1992–95	
	n	(%)	*n*	(%)	*n*	(%)	*n*	(%)	Total*(%)	
Site										
Hospitals	24	40	38	30	48	28	142	46	277	39
Residential homes	15	25	46	36	83	48	111	36	263	37
Foot outlets	13	22	24	19	20	12	37	12	96	14
Schools	1	2	6	5	9	5	7	2	24	3
Other sites	7	12	13	10	12	7	14	5	47	7
All sites	60	100	127	100	172	100	311	100	707	100

* Includes 37 outbreaks for which year of onset of first case was not known.

Table 3. *Size, attack rates, duration, and site of SRSV outbreaks: England and Wales, 1992–5*

	Persons affected per outbreak		Attack rates (%)		Duration of outbreak (days)	
	Median	No. of outbreaks*	Median	No. of outbreaks*	Median	No. of outbreaks*
Site						
Hospital	19	276	39	192	9	238
Residential facility	23	262	40	207	9	247
Food outlet	31	96	41	78	4	90
School	26	24	21	18	6	21
Other sites	23	47	30	38	4	44
All sites	22	705	39	533	8	640

* Outbreaks for which information was available.

persons (based on information from 389 SRSV outbreaks) and SRSV infection was confirmed in 21·5% of those tested. The number of cases, attack rates and duration of SRSV outbreaks in different sites are shown in Table 3. The data did not suggest that outbreaks in any site were becoming larger or smaller over time.

Information on symptoms was collected for 343 SRSV outbreaks during 1992–4. The number of outbreaks for which specific symptoms were known to be present in one or more affected persons were as follows: diarrhoea was a reported symptom in almost all outbreaks (340 of 343), vomiting in 330 outbreaks (96%), nausea in 196 (57%), abdominal pain in 167 (49%), and fever in 86 (25%). Estimates of the shortest incubation period ranged from 2 h to 2 days (median: 20 h); and the longest incubation period ranged from 7 h to 7 days (median: 50 h), based on information from 96 outbreaks.

Although foodborne transmission was reported in 97 SRSV outbreaks, in only 37 of these was one or more specific food item suspected as a vehicle of infection. A variety of foods were mentioned: 20 were cold food items, including fresh salads, sandwiches, fruit and vegetables, cakes and desserts and seafood. Contamination of oysters was demonstrated by microbiological examination in two outbreaks, and statistical evidence of a contaminated food vehicle was reported for an additional 21 outbreaks (including oysters on six occasions). For the remaining 14 outbreaks in which a specific food item was suspected, only circumstantial evidence was cited, such as 'child sick during reception', 'person vomited on site', or 'poor food preparation', and 'all affected persons ate suspected food'.

An infected food worker was a suspected contributory factor in 30 outbreaks, and for 8 of these there was additional statistical evidence to implicate a contaminated foodstuff.

There was a wide regional variation in numbers of SRSV outbreaks, ranging from 15 SRSV outbreaks from North Thames RHA to 239 from Northern and

Table 4. *Regional distribution of laboratory reports (1990–5) and outbreaks (1992–5) of SRSV infection, England and Wales*

	Laboratory reports, 1990–5: totals and mean annual rate per million population by age-group								Outbreaks, 1992–95*: totals by site					
	0–4 yr		5–64 yr		65 yr and over		Not known	All ages	Residential					
Region	*n*	Rate	*n*	Rate	*n*	Rate	*n*	*n*	Hospitals	Homes	Food outlets	Schools	Other sites	All sites
Northern and Yorkshire	444	166	322	10	914	143	385	2065	85	115	24	5	10	239
Trent	316	170	127	6	162	36	116	721	9	6	5	0	1	21
Anglia and Oxford	225	115	106	5	240	56	139	710	20	12	5	0	11	48
North Thames	165	55	49	1	50	8	78	342	9	3	2	0	1	15
South Thames	152	57	62	2	177	26	61	452	26	10	2	3	2	43
South and West	150	63	338	12	639	93	578	1705	62	34	37	3	11	147
West Midlands	184	85	35	1	78	16	34	331	34	46	6	5	5	96
North West	320	119	86	3	208	34	140	754	21	22	7	7	3	60
Wales	137	121	36	3	79	26	154	406	3	7	7	1	2	20
Not known	4		0		1		1	6	8	8	1	0	1	18
England and Wales	2097	102	1161	5	2548	52	1686	7492	277	263	96	24	47	707

* Includes 37 reports for which date of first case was not known.

Yorkshire RHA (Table 4). Two regions (Northern and Yorkshire, and South and West RHAs) together accounted for 55% of all outbreaks during 1992–5, and 50% of all laboratory reports during 1990–5. The number of outbreaks in residential facilities and hospital wards for the elderly varied from 10 in Wales to 200 in Northern and Yorkshire regions. After adjusting for the size of the over 65 population in each region there was still a 16-fold difference in reporting rate between the highest and lowest region.

Laboratory report rates (per million population) also showed wide regional variations, especially for persons aged over 65, which showed an almost 17-fold difference between the highest and lowest region (Table 4). There was considerably less variation in regional rates for children under 5 years old, with a threefold difference between highest and lowest regional rates.

Outbreaks in residential facilities and hospitals

The number of outbreaks in residential facilities increased from 15 in 1992 to 111 in 1995 (Table 1). SRSV accounted for 55% of all hospital and residential facility outbreaks reported to the surveillance scheme over the study period (data not shown). Of 277 hospital outbreaks, the type of ward was specified in 235, of which 228 (97%) were wards for elderly or geriatric patients. Only 3 outbreaks were reported on paediatric wards. Hospital outbreaks increased from 24 in 1992 to 48 in 1994, and then almost trebled to 142 in 1995, when 42 outbreaks occurred in January alone. An increase in reports was seen for almost all categories of reporter, and most notably for nurses who reported only one outbreak during 1992–3, and 63 outbreaks in 1995 alone.

The mode of transmission was reported as mainly person-to-person in 504 (93%) outbreaks in residential facilities and hospitals, as mainly foodborne in 9 (1·7%) outbreaks, and as combination of both modes in 14 (2·6%). Outbreaks in residential facilities and hospitals tended to involve fewer persons (median 20 per outbreak) and last longer (median 9 days) than outbreaks in other sites. The number of laboratory reports from persons aged over 65 years correlated well with the number of outbreaks occurring each month in hospitals and residential facilities (Fig. 1). Both outbreaks and laboratory reports showed a clear seasonal pattern, with most occurring in the winter and spring and fewest in the mid to late summer. Both

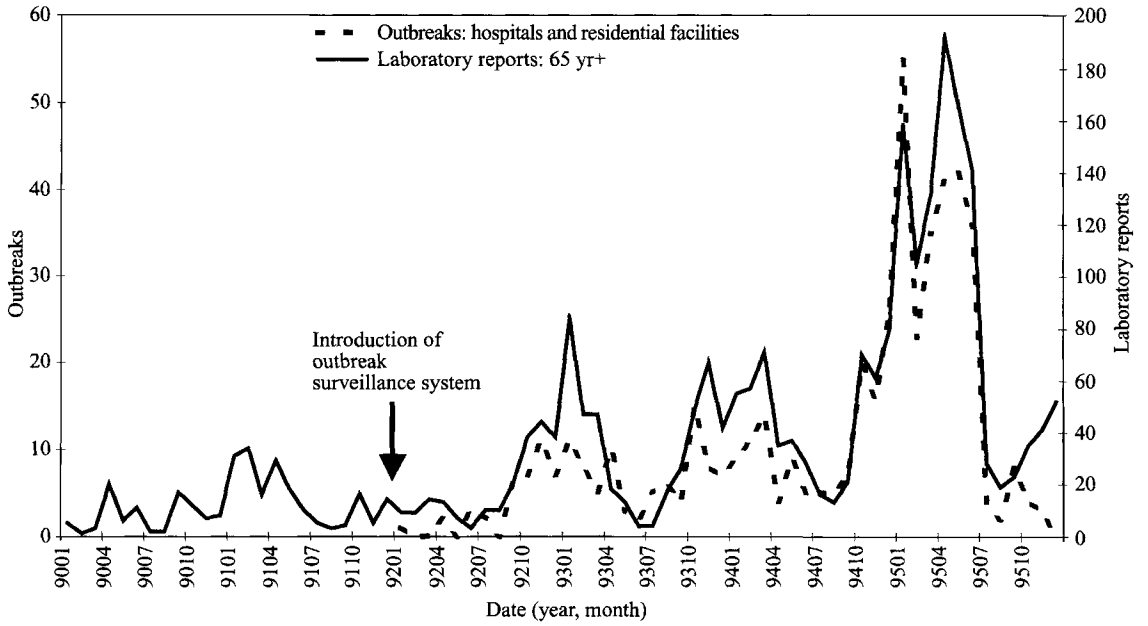

Fig. 1. SRSV outbreaks in hospitals and residential homes, and laboratory reports from persons aged 65 years and over: England and Wales, 1990–5.

outbreaks and laboratory reports increased sharply in 1995, with a peak of 55 outbreaks in January 1995. Numbers of outbreaks and laboratory reports diverged at the end of 1995, with outbreaks falling off and laboratory reports increasing.

The 540 SRSV outbreaks occurring in hospitals and residential homes between 1992–5 generated at least 1561 SRSV identifications from affected persons each of which, in theory, should have resulted in a laboratory report to CDSC. This would account for 69% of the 2269 laboratory reports from persons aged 65 years or over during the same period.

Outbreaks in commercial food outlets, schools and other sites

There were 96 outbreaks associated with commercial food outlets and numbers increased from 13 in 1992 to 37 in 1995 (Table 2). A wide variety of food outlets were involved – including hotels, pubs and bars, restaurants, and fast food outlets. The mode of transmission was reported as mainly foodborne or mixed person-to-person and foodborne in 52 outbreaks, as mainly person-to-person in 41 outbreaks, and was not stated for 3 outbreaks.

Five of the 24 reported school outbreaks occurred in nurseries, 11 were in junior or infant schools, 2 in secondary schools, and 1 in a further education college. School outbreaks were characterized by a lower attack rate than for outbreaks in other sites, and involved on average 43 persons. Mode of spread was reported as mainly person-to-person in 22 of the outbreaks and mainly foodborne in 2. SRSV infection was confirmed in an average of two individuals per school outbreak.

There were 5 outbreaks in nurseries or creches which probably involved children aged under 5 years. These outbreaks generated 13 SRSV identifications, compared with 1629 laboratory reports of SRSV infection in children aged 0–4 years that occurred in the same years.

Forty-seven outbreaks occurred in sites other than those mentioned above, including: 9 outbreaks (involving an average of 30 persons) in settings such as training and day centres and work premises where there was likely to be daily contact between the same persons; and 10 outbreaks (involving an average of 51 persons) in settings where people might share communal facilities, including sleeping, eating and washing areas on a 24-h basis. These included colleges, holiday camps or campsites, and armed forces institutions. A further 7 outbreaks, involving an average of 70 persons, could not be classified in this manner from the information provided, and for 13 outbreaks, involving an average of 30 persons, no information about the site was given.

SRSV outbreaks in food outlets, schools (other than nurseries and creches) and 'other' sites generated

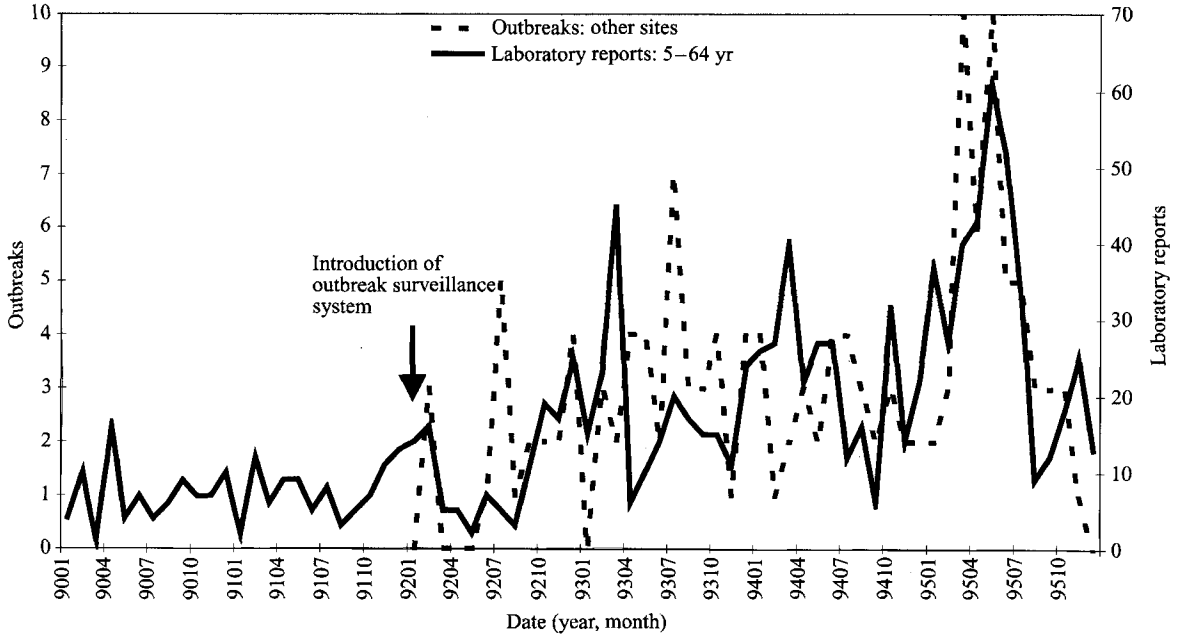

Fig. 2. SRSV outbreaks in other sites, and laboratory reports from persons aged 5–64 years: England and Wales, 1990–5.

at least 476 SRSV identifications, which was equivalent to 48% of the 986 SRSV laboratory reports from persons aged 5–64 years during the same time.

SRSV laboratory reports from persons aged 5–64 years are shown by month of occurrence in Figure 2, along with outbreaks in commercial food outlets and other settings not likely to involve paediatric or elderly populations. The correlation between numbers of outbreaks and laboratory reports was weaker than seen between outbreaks involving elderly persons and laboratory reports from persons over 65 years of age. A seasonal pattern was more evident at the end of the study period than in the earlier years.

DISCUSSION

SRSVs were the single most commonly identified pathogen in outbreaks of gastroenteritis in England and Wales during 1992–5, accounting for over a third of all reported general outbreaks of gastrointestinal illness and more than half of all reported outbreaks in hospital geriatric wards and residential facilities for the elderly.

The characteristics of the SRSV outbreaks presented here are consistent with previously documented results. Attack rates were high (median 39%), and vomiting and diarrhoea were both very common. Human challenge studies have shown that the incubation period for SRSV infection is dose-dependent and is usually 15–50 h [13–15], while in this dataset the best estimate was 20–50 h. In a few outbreaks, however, the shortest incubation period was considerably less than 15 h, but there was no further information to help assess the validity of these data. Incubation periods of up to 7 days were also reported and this may have been due to misclassification of secondary (or tertiary) cases as primary cases. The long duration of many outbreaks relative to the incubation period suggests that propagation of outbreaks through secondary transmission is common.

A seasonal pattern was apparent, with both outbreaks and laboratory reports occurring most frequently in the winter and least frequently in midsummer. The seasonal pattern was clearest for outbreaks in hospitals and residential facilities for the elderly, and for laboratory reports from persons aged over 65 years, or under 5 years.

The outbreak data are biased because outbreaks in hospital wards or residential homes, which can be severe and disruptive, are unlikely to go unnoticed by medical staff, and are therefore more likely to be investigated than outbreaks in other settings where cases may be widely dispersed in a community or geographic region, or otherwise difficult to identify and contact. Outbreaks involving well defined 'captive' populations are also more likely to yield appropriately timed clinical specimens for the identification of SRSV [23, 28]. Indeed, cases from outbreaks in hospital wards and residential facilities for the elderly accounted for up to 69% of laboratory

reports from persons aged 65 years and over, while among persons aged 5–64 years, outbreak related cases could account for only 48% of laboratory reports, suggesting that underreporting of outbreaks is more common in the latter group. Furthermore, the temporal association between peak number of SRSV outbreaks and outbreaks of unknown aetiology in this dataset [25] suggests that a significant number of SRSV outbreaks were investigated but no pathogen identified – perhaps because appropriate faecal specimens were not collected and submitted in a timely manner to a laboratory with a high degree of expertise in diagnosis.

Electron microscopic diagnosis of SRSV infection is expensive, time consuming and requires substantial technical expertise. Because of the low sensitivity of EM for detecting SRSV in sporadic cases of gastrointestinal illness in adults and other children, PHLS units generally restrict the use of EM to outbreak related cases; and sporadic cases among young children [20]. Consequently, sporadic cases in older children and adults are underestimated, and the laboratory data do not give a representative picture of the burden of infection in different age groups. Routine resting of sporadic cases in adults and other children is likely to be dependent on the development of antigen detection assays using recombinant antigens to SRSVs, or other novel methods [4].

Outbreaks in residential facilities and hospitals

Seventy-six percent of all reported SRSV outbreaks occurred in residential facilities for the elderly and hospital geriatric wards. More than 14000 persons were known to have been affected in these outbreaks, and there were 17 'SRSV-associated' deaths. However, the extent to which SRSV infection contributed directly to those deaths cannot be determined from these data. These numbers give some indication of the burden of illness associated with SRSV outbreaks in these settings. In addition, the wide regional variations in the numbers (and rates) of laboratory reports and outbreaks involving elderly persons, suggest that SRSV outbreaks are underreported. The 31% of laboratory reports from persons aged 65 years and over, that are not accounted for by outbreaks in hospitals and residential homes, also indicates that underreporting occurred. Some of the 'excess' laboratory reports are likely to have come from unreported outbreaks in residential facilities and hospitals, and from elderly persons involved in outbreaks in other settings; only a small number are likely to be from sporadic cases, since testing of specimens from sporadic cases other than young children is contrary to usual practice in PHLS EM diagnostic facilities [25].

SRSV outbreaks in hospitals and residential homes increased almost 6·5-fold between 1992 and 1995, more than in any other site, while laboratory reports from persons over 65 years increased fivefold. Improvements in ascertainment may help explain this increase, and numbers might be expected to increase as more investigators became aware of the outbreak reporting system in the years immediately following its introduction. Indeed, the number of hospital microbiology laboratories which reported SRSV infections almost doubled between 1990 and 1995. It is not clear, however, why the increase was greater for SRSV outbreaks than for all other pathogens with the exception of rotavirus outbreaks (which increased from 2 in 1992 to 18 in 1995), and for residential facilities and hospitals more than for any other site. The increase was also greatest (around ninefold during 1992–5) in two regions which are served by PHLS EM units (Leeds PHL and Bristol PHL) with long-standing research interest in SRSV infection, where the procedures for investigating and reporting SRSV outbreaks are well developed, and the many different health care professionals involved in this activity are well educated to the possibility of viral aetiology or outbreaks of gastrointestinal illness. The specificity of the reported increase is difficult to account for, and therefore provides at least circumstantial evidence for a real increase in numbers of SRSV outbreaks in hospital and residential homes. However, further studies collecting denominator-based data are needed to address this question properly.

Rapid control measures are essential to prevent spread of infection once introduced into semi-closed communities, and may include deep disinfection of contaminated surfaces, cohorting of affected persons, and exclusion of ill employees, all of which may cause considerable disruption to normal activities, and may even require temporary closure of wards [11, 13, 28, 29]. Education of staff in good control of infection policies is also essential to reduce the chance of introduction or spread of SRSV to high-risk settings [11, 14, 28, 29]. Further studies are required to define and quantify more accurately the burden of these outbreaks in residential homes and hospitals in terms both of morbidity and socioeconomic costs. Possible

consequences of SRSV infection in the elderly, or patients with severe underlying illness, may include interruption of treatments with orally administered drugs, delayed recovery, and longer hospital stays.

Future epidemiological studies should address why SRSV outbreaks are relatively common in residential facilities and hospital wards for the elderly, yet so few are reported in paediatric or general wards. A better understanding of the factors involved in the introduction and spread of infection into these settings would aid control efforts. Another question that should be addressed in future studies is whether it is only the 'institutionalized' or hospitalized elderly who are at special risk from SRSV infection or whether this applies more generally to the elderly population.

Outbreaks in commercial food outlets, schools and other sites

Less than a quarter of all SRSV outbreaks were in sites other than geriatric wards and residential facilities for the elderly, and numbers increased almost threefold between 1992 and 1995.

Commercial food outlets accounted for 57% of these 'non-geriatric' SRSV outbreak sites, schools for 14%, and day centres, work premises and institutions with residential facilities for a further 11%. SRSV accounted for 9% of all reported outbreaks in these sites in 1992, and 25% in 1995.

There were very few outbreaks in nurseries or other settings likely to involve mainly young children. The large number of laboratory reports from children aged under 5 years therefore suggests that many SRSV infections in this age group occur as sporadic cases, although some may actually be part of more general community-wide outbreaks that cannot be identified by the general outbreak surveillance system. They may also arise as part of unrecognized point source outbreaks, or single family or household outbreaks, which are not reported to the outbreak surveillance system.

Foodborne transmission of SRSV infection

Foodborne transmission was reported to have occurred in 97 (14%) SRSV outbreaks, of which 52 involved commercial food outlets. Surprisingly, in a large proportion of outbreaks in food outlets, the main reported mode of transmission was person-to-person. If correct, this suggests that secondary transmission from persons initially infected through contaminated food is important. However, since no definitions for mode of transmission are provided on the questionnaire, some degree of misclassification is possible, especially in the case of SRSV, where it may be difficult to distinguish primary and secondary cases, because of the short incubation period.

Oysters and other shellfish can concentrate SRSVs from contaminated waters in their tissues, and have frequently been shown to be a vehicle of SRSV infection [9–11, 13, 30–37]. Oysters were the single most commonly suspected food vehicle in this dataset, and sensitive PCR-based methods are now available for the detection of SRSVs in shellfish [4, 38]. Molecular methods may become available for the detection of SRSVs in other foodstuffs, which currently can only be implicated by statistical or circumstantial evidence. SRSVs are inactivated by heat so that foods like salads that require handling but are not heated immediately before consumption may be more vulnerable to contamination, either from the environment or directly from an infected food-worker. Transmission of SRSV infection from infected food-workers is well documented [9–11, 13, 20, 21], and was the most common suspected contributory factor in general outbreaks in commercial food outlets during 1992–5. Good food preparation practices remain the key strategy for prevention of foodborne SRSV outbreaks, and must include strict standards for personal and environmental hygiene, and food preparation and storage, and exclusion of food-workers with gastrointestinal symptoms [10, 13, 29].

Because of the limitations of the two surveillance schemes, including an underestimation of sporadic cases of SRSV infection in the community, data presented cannot provide a definitive picture of the relative burden of SRSV infections in different population groups and settings. A prospective community-based study, such as the Infectious Intestinal Disease in England and Wales study, will better address this issue [39]. In addition, new molecular methods will provide sharper tools for SRSV identification in individuals, and identify patterns of transmission in outbreaks [40–45].

The surveillance data do show, however, that SRSV is the most common cause of outbreaks of infectious intestinal disease among elderly persons in hospitals and residential facilities. Outbreaks in these settings have increased more than in any other site, but part of this increase may be due to improved ascertainment. More work is therefore required to

quantify accurately the burden of SRSV infection among the institutionalized or hospitalized elderly, to inform resource allocation decisions and improve control and prevention strategies.

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