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Short communication

Hepatitis B vaccine coverage in short and long stay prisons in Wales, UK 2013–2017 and the impact of the global vaccine shortage ☆

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ABSTRACT

Data on hepatitis B vaccination coverage across prisons in Wales 2013–2017 were analysed to describe coverage of one dose, and the full hepatitis B vaccine course for men in prison. Whilst vaccination coverage increased in both short and long stay prisons, annual coverage was consistently lower in short stay prisons compared to long-stay prisons, despite short-stay prisons delivering a higher numbers of vaccine doses. The exception of this pattern was in 2017, at a time of global vaccine shortage. The data demonstrate the need for all prisons to work together to ensure men in prison can receive the full hepatitis B vaccine course. Collaborative working will be required to recover from the vaccine shortage and to achieve higher coverage than the plateau in 2016.

1. Introduction

Those in prison are internationally recognised as a high-risk group for hepatitis B infection. Since 2001, UK policy has advised hepatitis B vaccination for all those in prison, using the super-accelerated schedule of delivery (vaccination at 0, 1 and 3 weeks, followed by a booster at 12 months). There are six male prisons in Wales holding a mixture of sentenced, convicted and remanded men. There are no female prisons in Wales with Welsh women being held in England. The Welsh prison population at the end of December 2018 was 4534 [5]. Hepatitis B vaccinations in Welsh prisons are offered through an opt-in programme and delivery of vaccinations should start as closely to admission to prison as possible. Vaccinations are provided by the prison health service. Responsibility of prison healthcare in public sector prisons in Wales rests with the Welsh Government, with accountability for delivery and planning being held by the National Health Service in Wales [7]. Evidence suggests the prison vaccination program has played a significant part in keeping rates of hepatitis B infection low amongst injecting drug users across England, Wales and Scotland [4,9]. Since 2001 coverage and uptake across UK prisons have been variable, but notably increasing. In 2003, median hepatitis B vaccine coverage across prisons in England and Wales was found to be 17% [2], this increased to 22% in 2010 [1]. Despite this positive increase, the latter study found Welsh prisons had the lowest median coverage in 2012 of all prisons in England and Wales at 16%. Whilst these estimates were based on coverage of at least one dose and did not extend to the completed courses, the figures remained concerning. In 2011, the method for collecting data on hepatitis B vaccinations in Welsh prisons changed to recognise both the number of vaccines delivered and completion of the three dose primary course. In July 2017, UK prisons were affected by global supply constraints of the hepatitis B vaccine [10]. We aimed to document trends in hepatitis B coverage from 2013 to 2017, by prison type and to consider the impact of the global hepatitis B vaccine shortage on coverage.

2. Method

Data on hepatitis B vaccine coverage in Welsh prisons were extracted from the prison electronic clinical record (SystemOne), using read-codes to determine vaccination status (at least one dose, or three doses). All vaccinations delivered in the prison are recorded on SystemOne. History of vaccinations received in the community would be self-reported and added onto SystemOne, using clinical (Read) codes. The number of men in prison who had received at least one dose and numbers who had received a full course of hepatitis B vaccinations (full primary course of vaccination at 0, 1 and 3 week) were ascertained on the first day of each month from 2013 to 2017 (five years). Denominators used for population coverage calculations were the operating capacity figures

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for each prison at that point in time. No deductions were made from denominators for fully vaccinated men or those contraindicated for vaccination. Monthly coverage figures were calculated by prison type (two short-stay prisons and three long-stay prisons), Wilson proportional 95% confidence intervals (95% CI) were calculated around percentage coverage figures using StataSE™ [11]. Significant differences ($p < 0.05$) in uptake figures were assessed using the two-sample test of proportions in StataSE™. Data from January 2013 to December 2017 were analysed to examine median monthly coverage of men having received at least one hepatitis B vaccine dose and median monthly numbers of men having received the full hepatitis B vaccine course. The numerator for annual coverage figures in each prison was the median monthly number of prisoners in each prison with at least one hepatitis B dose (dose 1 coverage) or three doses (full course coverage) for each calendar year, the denominator was the median monthly operating capacity for the same period. Annual percentage coverage figures were calculated by aggregating median monthly numerators and denominators for each prison type.

Data were analysed by individual prison, all prisons collectively and by long stay and short stay prisons. For the purposes of this paper, short stay prisons describe remand centres serving the local courts, long stay prisons are those taking men convicted of 12 months or more and include training and resettlement sites.

The monthly number of vaccine doses administered from each prison site was collected to monitor performance and has been used in this analysis to consider impact of the vaccine shortage.

3. Results

Median coverage of one hepatitis B vaccine dose increased significantly from 41.6% (95% CI 39.9–43.3) in 2013 to 55.1% (95% CI 53.5–56.8) in 2017, a 32.5% increase from the 2013 figure (Table 1). Coverage of the full course increased by a greater proportion from 28.7% (95% CI 27.1–30.3) in 2013 to 39.6% (95% CI 38.0–41.2) in 2017, a 38.0% increase from the 2013 figure. Coverage across all prisons collectively increased over 2013–2016 but saw a decrease in the second half of 2017 in line with the global hepatitis B vaccine shortage (Fig. 1).

Coverage for both one dose and the full course increased in both long and short stay prisons. Annual coverage was significantly lower in short-stay prisons compared to long-stay prisons, apart from in 2017. The greatest increases in coverage have been short stay prisons, which in 2017 reached comparable levels to that seen long-stay prisons.

Long stay prisons demonstrated marginally higher rates of coverage for men with both one vaccine and the full course than short stay prisons (by 1.8% and 1.5% higher respectively) (Table 2).

The monthly number of vaccine doses administered monthly in Welsh prisons averaged as 326 (range 292–447). The greatest variation in monthly doses administered was seen in long-stay prisons; with a range of 31–146, compare to short stay prisons range 184–345.

4. Discussion

This is the first study to demonstrate impact of the global hepatitis B vaccine shortage on a high-risk population in a custodial setting. It is the first exploration of hepatitis B vaccine coverage trends in prisons in Wales. Coverage has increased significantly over the five years. Results indicate that prisons in Wales have higher levels of hepatitis B vaccination coverage compared to previously published figures for England and Wales [2,1]and certainly since the last estimation of coverage in Wales at 16% [1]. The increase in coverage was noted in both long and short stay settings despite an increase in the median operational capacity of prisons in Wales from 3215 in 2013 to 3560 in 2017 (Table 1).

Whilst the recommendation to offer hepatitis B vaccination to all men in prison has been in place in England and Wales since 2001, more recent publications such as the 'Physical Health of People in Prison' from the National Institute for Health and Care Excellence [8] have repeated this advice and are likely to have contributed to national increases in coverage. Wales has seen policy commitments to address blood borne viruses (BBVs) nationally and in prisons, hepatitis B vaccination plays a part in this [12]. Wales has committed to the World Health Organisation (WHO) target to eliminate hepatitis as a major public health threat by 2030 and the value of hepatitis B provision as a preventative measure is recognised within this [13].

We hypothesised that short-stay prisons would see a higher delivery of vaccines with lower coverage and long stay prisons would see a lower delivery but with higher coverage. This was based on the premise that the majority of men in prison spend time in short-stay remand prisons before moving to long-stay prisons. Thus long stay prisons will receive many men who should already have received the initial vaccines in the short stay settings.

Table 1
Annual coverage estimates and 95% confidence intervals for at least one dose and a full course of hepatitis B vaccine, by prison type (two prisons were short-stay facilities and three were long-stay).

Prison type	a Year	b Median monthly operating capacity (n)	c Median monthly new intake (n)	d Median monthly numbers of men with at least 1 hep B dose (n)	e Hep B1 uptake % (d/b * 100)	f 95% CI	g Median monthly numbers of men with full hep B course (n)	h Hep B full uptake % (g/b * 100)	i 95% CI	j Median monthly numbers of doses given (n)
All	2013	3214.5	759.5	1338	41.6	(39.9–43.3)	922	28.7	(27.1–30.3)	346
	2014	3204	697.5	1611	50.3	(48.6 – 52.0)	1158	36.1	(34.5–37.8)	292
	2015	3477.5	818.5	1975	56.8	(55.1–58.4)	1315.5	37.8	(36.2–39.5)	446.5
	2016	3506	788	1990	56.8	(55.1–58.4)	1439	41	(39.4–42.7)	283.5
	2017	3560	852.5	1962.5	55.1	(53.5–56.8)	1409.5	39.6	(38.0–41.2)	261.5
Short-stay	2013	1239	550	417	33.7	(31.1–36.3)	218	17.6	(15.6–19.8)	200
	2014	1259	517	518	41.1	(38.5–43.9)	336	26.7	(24.3–29.2)	184
	2015	1275	555	679	53.3	(50.5–56.0)	437	34.3	(31.7–36.9)	345
	2016	1309	547	684	52.3	(49.5–54.9)	496	37.9	(35.3–40.6)	241
	2017	1304	583	704	54	(51.3–56.7)	504	38.7	(36.0–41.3)	231
Long-stay	2013	1976	210	922	46.7	(44.5–48.9)	704	35.6	(33.5–37.8)	146
	2014	1945	181	1093	56.2	(54.0–58.4)	822	42.3	(40.1–44.5)	108
	2015	2203	264	1297	58.9	(56.8–60.9)	879	39.9	(37.9–42.0)	102
	2016	2197	242	1306	59.4	(57.4–61.5)	943	42.9	(40.9–45.)	43
	2017	2256	270	1259	55.8	(53.7–57.8)	906	40.2	(38.2–42.2)	31

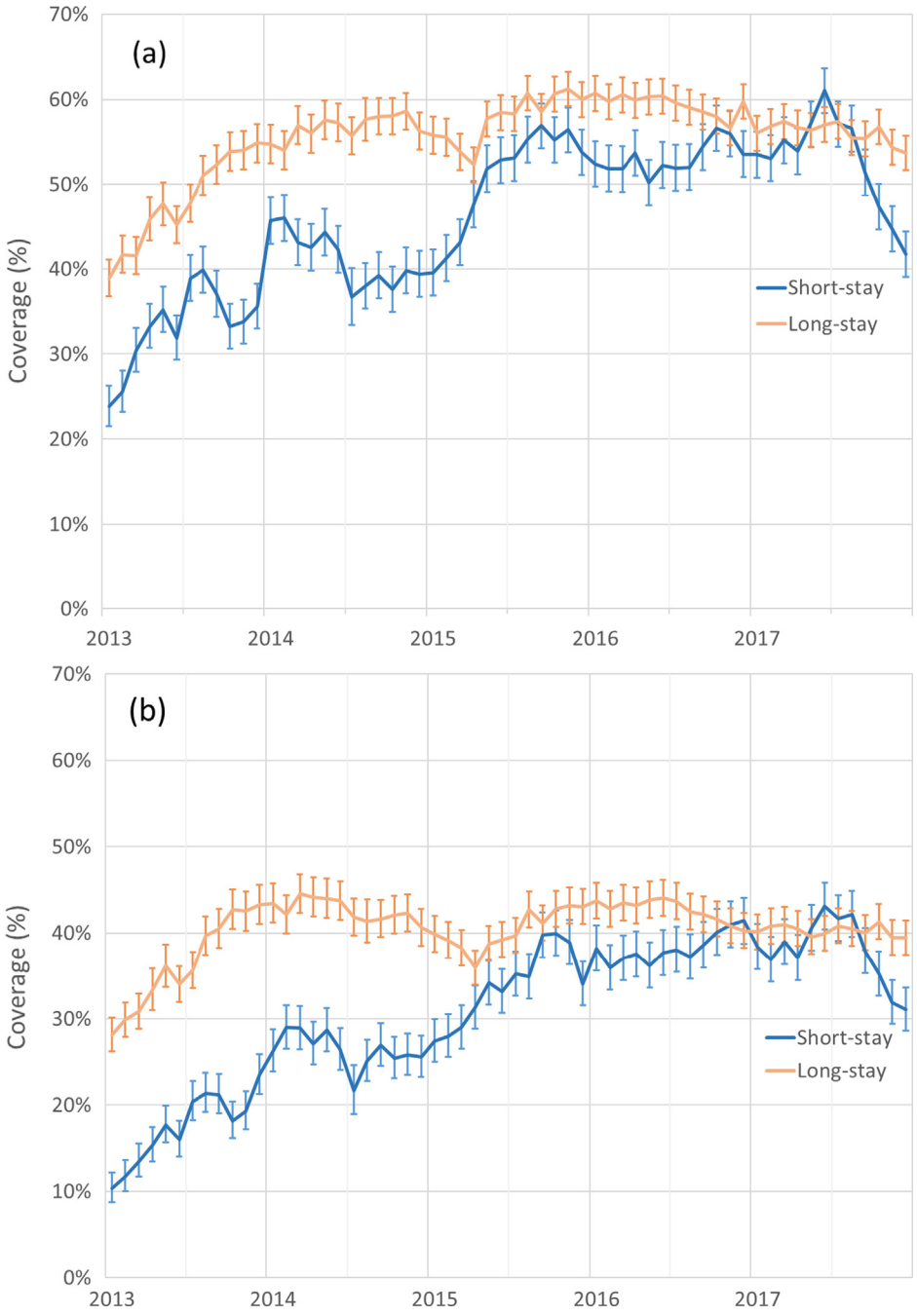

Fig. 1. Monthly trends in hepatitis B coverage in Welsh prisons, by prison type, 2013–2017, for (a) at least one hepatitis B dose and (b) a full course.

Long stay prisons demonstrated higher coverage than short stay prisons (Table 2); however, the difference was very small, less than 2% higher coverage for both men having received one vaccine and men having received the full course. Use of the super-accelerated vaccine schedule (0, 7 and 21 days) is likely to mean the full course of vaccines can still be achieved within the short-stay settings and may go some way to explain the small difference in coverage between short and long stay sites. This demonstrates the importance of starting the vaccine schedule as close to admission as possible, thus maximising chances of completing the course before release.

Between 2013 and 2015 short stay prisons increased their vaccine coverage more rapidly than long-stay prisons (Fig. 1), in line with an increasing number of monthly doses being administered (Table 1). There was no discernible seasonality in monthly uptake figures. Between 2013 and 2017 coverage in long stay prisons remained consistently above that of short-stay prisons despite long-stay prisons seeing decreases in the number of vaccine doses administered. This suggests that coverage in long stay prisons is reliant on the vaccine doses being given by short stay establishments. The plateau of coverage in 2016 demonstrates that long stay prisons cannot rely on the performance of short stay prisons to continue increasing coverage. Both short and long stay custodial settings have a role to play in ensuring all those passing through the prison setting can access hepatitis B vaccination.

The decrease in coverage from 2016 to 2017 coincided with the global hepatitis B vaccine shortage [10]. Whilst those in prison remained a priority group for receiving the vaccine, stocks to pris-

Table 2
Summary of difference in coverage (and 95% confidence intervals), by prison type. Differences in uptake were tested using the two-sample test of proportions.

Vaccination status	Year	Short stay			Long stay			Difference in % uptake	p
		Median monthly operating capacity (n)	Hep Buptake (%)	95% CI	Median monthly operating capacity (n)	Hep Buptake (%)	95% CI		
At least one hepatitis B dose	2013	1239	33.7	(31.0–36.3)	1976	46.7	(44.5–48.9)	13	<0.001
	2014	1259	41.1	(38.4–43.9)	1945	56.2	(54.0–58.4)	15.1	<0.001
	2015	1275	53.3	(50.5–56.0)	2203	58.9	(56.8–60.9)	5.6	0.001
	2016	1309	52.3	(49.5–55.0)	2197	59.4	(57.4–61.5)	7.2	<0.001
	2017	1304	54	(51.3–56.7)	2256	55.8	(53.8–57.9)	1.8	0.293
Full primary course	2013	1239	17.6	(15.5–19.7)	1976	35.6	(33.5–37.7)	18	<0.001
	2014	1259	26.7	(24.2–29.1)	1945	42.3	(40.1–44.5)	15.6	<0.001
	2015	1275	34.3	(31.7–36.9)	2203	39.9	(37.9–41.9)	5.6	0.001
	2016	1309	37.9	(35.3–40.5)	2197	42.9	(40.9–45.0)	5	0.003
	2017	1304	38.7	(36.0–41.3)	2256	40.2	(38.1–42.2)	1.5	0.375

ons were restricted with advice to consider dose-sparing. Thus the reduction in coverage can be attributed to both reductions in stock and prudent use to prevent wastage. The data demonstrate the impact of supply chain shortages on population coverage. Decreases in uptake occurred more rapidly in the short stay prisons. A similar trend can be predicted for the long-stay prisons; as many unvaccinated men will move from short to long stay settings. Our data clearly suggests vaccination catch-up programs at long stay prisons will be needed for those men arriving from short stay settings that have been affected by the shortage. Long stay prisons will be unable to rely on initial doses having been given in short stay establishments and therefore will have a key role to play in recovery from the shortage. As short-stay prisons saw a more rapid increase in coverage from 2013 to 2015 the data suggests they will be able to recover more quickly from the vaccine shortage.

If vaccine uptake were to increase at the same rate that it did during 2013–2017 (where the increase in uptake was most rapid), it would take 23 months for short-stay prisons to again reach the level seen before the vaccine shortage for dose on coverage and 18 months for full course coverage to recover. The equivalent recovery estimates for long-stay prisons are six months and three months for dose one coverage and full course coverage respectively.

Whilst efforts will need to be focused on recovery from the hepatitis B vaccine shortage to pre-shortage levels, we recognise that efforts need to also drive increase above those seen in the plateau of 2016. Once supply is fully reinstated, thought needs to be given to capacity at service level to drive forward improvements.

The number of vaccine doses administered each month in Welsh prisons was variable. Despite these fluctuations, an increase in overall vaccine coverage was maintained. Once an individual has completed their vaccination course, no further vaccines would be needed on future readmissions to prison. Once individuals with a history of multiple short admissions have received the full course, prisons receiving repeat offenders should be able to maintain coverage alongside a reduction in the number of vaccine doses administered. Short-stay local remand prisons experience a high turnover of men. The proven offending rate for adult offenders released from custody in 2016 was 48.9%, increasing to 64.9% for offenders released from sentences of less than 12 months [6]. Theoretically, if there was optimal hepatitis B vaccination delivery in prisons, after time, only those on their first admission to prison should need vaccinating.

5. Limitations

Operational capacity was used as the denominator for vaccination coverage. It was not known if prisons were operating below or above this capacity. Recent data on prison overcrowding suggests Welsh prisons would have been operating at this level, or above [3].

In many cases, ascertainment of hepatitis B vaccination history on entry to prisons would rely on self-reporting. Data were unavailable on the number of men coming into prison having already completed a course of hepatitis B vaccination, numbers of men declining vaccination, or total number of men offered vaccination.

Published data from the Ministry of Justice on the demographics of those held in prison is published for England and Wales inclusively. Welsh data is not disaggregated therefore we could not determine national uptake against demographics such as age, country of birth or sentence length.

6. Conclusion

The results demonstrate higher levels of hepatitis B vaccine coverage across prisons in Wales than previously estimated. Coverage increased alongside recommendations of vaccination within published national guidance that could suggests the benefit of policy on clinical outcomes. Data suggest hepatitis B vaccination services have become embedded at short stay settings. A decline in doses administered at long stay settings and a slower increase in coverage suggests improvements in delivery at these establishments could have a significant impact on overall coverage. There was a notable decrease in coverage in tandem with the global shortage of hepatitis B vaccinations, long stay prisons will have a key role to play in the recovery of vaccination coverage, ensuring they offer vaccination to all unvaccinated men arriving from short stay prisons. Examination of the data by long and short stay prison proves the value in prisons working together to ensure men can complete the vaccination course as they move through the prison system.

Conflict of interest

The author declared that there is no conflict of interest.

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