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**A summary of the updated report on the incidence and epidemiological trends of keratinocyte cancers in the United Kingdom 2013-2018**

Skin cancer is the commonest cancer in the UK. Skin cancer referrals via the two-week wait (urgent suspected cancer) pathway outnumber any other suspected malignancy.[1, 2] The commonest skin cancers are keratinocyte cancers (KCs) which represents Basal Cell Carcinomas (BCC) and Cutaneous Squamous Cell Carcinomas (cSCC). Accurate KC incidence reporting is crucial for healthcare planning.

Registration of KC is challenging due to high numbers, multiplicity of cancers per person and various treatment modalities, not all surgical. The incidence of KC routinely reported in the UK is underestimated due to the current United Kingdom and Ireland Association of Cancer Registries rule recommending that only the first BCC and cSCC per person be registered, however metachronous tumours are uniquely common to KC.[4] Previously, we validated the 1st per patient per annum (1st PPPA) technique where one tumour per patient per calendar year is counted as a better estimate of true tumour count; identifying 50% more tumours and within 10% of the true tumour incidence without additional workload.[5]

We provide a summary of the updated report on KC epidemiological trends in the United Kingdom 2013-18 with 3 additional years of data, improved Welsh data and lifetime incidence reporting, the full version is available online at (***TBC***). Data from the National Cancer Registration and Analysis Service (NCRAS), England were combined with data from national cancer registries in Scotland, Northern Ireland and Wales from 2013 until 2018 to calculate counts

and incidence rates.[6] Further analysis was performed using NCRAS data only, using robust and Poisson regression. Lifetime incidence of non-melanoma skin cancer (NMSC) was calculated using the Cancer Research UK current probability life-time risk calculator using the first all-time NMSC tumour registered.[7,8] Lifetime incidence analysis is limited by mortality data to NMSC and therefore includes rare NMSC e.g. Merkel cell carcinoma.

In England, from 2013-18, the average annual count of 1st PPPA tumours were 146,852 BCCs and 39,017 cSCCs. BCC European Age Standardised Rates (EASRs), fig.1, increased by an average of 6.2 cancers per 100,000 persons per year (PY) (95% Confidence Interval (CI) -0.1, 12.5), with a decline seen in 1st all-time BCCs of 1.2 cancers PY (95% CI -4.6, 2.3), both being non-significant. The EASR of 1st PPPA cSCC increased on average by 2.8 cancers PY (95% CI 1.7, 4.0), with 1st all-time cSCC increasing by 1.4 cancer PY (95% CI 0.7, 2.2).

In Scotland, the average count for 1st PPPA BCC and all cSCC (all cSCC are manually registered in Scotland) were 13,300 and 3,344 from 2013 to 2018. BCC EASR increased on average by 4.1 cancers PY, although this was non-significant (95% CI -2.9, 11.0). cSCC EASR increased on average by 1.4 cancers PY (95% CI 0.6, 2.2).

In Northern Ireland, 1st PPPA BCC and cSCC average counts were 4,423 and 1,506 from 2013 to 2018, BCC EASR increased by an average of 5.9 cancers PY (95% CI 1.4, 10.5) and cSCC EASR increased by an average of 1.8 cancers PY (95% CI 0.1, 3.5).

In Wales, 1st PPPA BCC and cSCC average counts were 10,516 and 3,358 from 2016 to 2018. Welsh data for previous years was not available.

One in five (19.7%) people develop at least one BCC, cSCC or other non-melanoma skin cancer in their lifetime in England, this equates to one in four (22.3%) males and one in six (17.5%) females.

Under the age of 50 we saw a reversal of the male:female ratio with BCC significantly more common in females than males (IRR 1.37, 95% CI 1.34-1.41) as opposed to the trend seen in older patient groups and the whole population.

Incidence rates of 1st all-time and 1st PPPA BCC appear to plateau whereas cSCC continues to significantly increase, however more years of data are required to assess the trend. Similar findings with a plateau in KC incidence rates has been predicted by Garbe et al based on data from registries from Germany and Scotland.[9] This could be due to natural variation or changes in clinical practice and patient choice; greater awareness of end of life planning and prolonged waiting lists may encourage conservative management of these tumours, where appropriate, or perhaps there is greater skin cancer awareness and prevention.
The reversal of the male:female ratio in younger age groups is of concern and may be due to lifestyle factors such as increased sunbathing among young females.

With one in five persons developing NMSC in their lifetime, optimisation of skin cancer research, prevention and clinical management and is essential.

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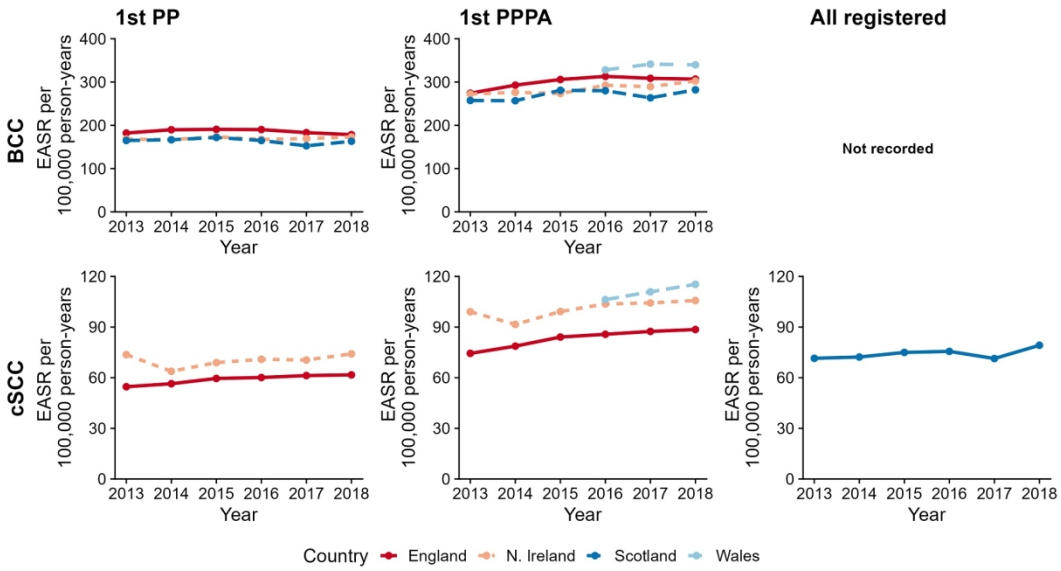
**Figure legends**

**Fig 1.** National incidence rate of BCC and cSCC based on three counting techniques. Column 1. National EASR of BCC (top) and cSCC (bottom) 2013-18, using 1st per patient all-time (1st PP) technique. Column 2. National EASR of BCC and cSCC 2013-18, using 1st per patient per annum (1st PPPA) technique. Welsh data cover 2016-18. Column 3. National EASR of BCC and cSCC 2013-18, using all registered tumours (All registered) technique. Dotted lines indicate 95% confidence intervals. EASR, European age-standardised rate; BCC, basal cell carcinoma; cSCC, cutaneous squamous cell carcinoma;

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