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Te Whatu Ora



# Healthy Homes Initiative

*Five year outcomes evaluation*

November 2024



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## Ngā mihi nui,

The evaluation team.

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## DISCLAIMER

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) and Longitudinal Business Database (LBD) which are carefully managed by Stats NZ. For more information about the IDI and LBD please visit <https://www.stats.govt.nz/integrated-data/>.

Access to the data used in this study was provided by Stats NZ under conditions designed to give

effect to the security and confidentiality provisions of the Data and Statistics Act 2022. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes

and is not related to the data's ability to support Inland Revenue's core operational requirements.

Numerical results in this report are rounded to protect the anonymity of participants. This will not affect the precision of estimates.

# KEY FINDINGS



The Healthy Homes Initiative (HHI) is improving the lives of whānau. By helping to ensure whānau are living in warm, dry and healthy homes, the HHI is improving health and providing social benefits. The programme is making a large-scale impact and to date has supported over 200,000 people.



Five years after the HHI intervention, participants experienced significant health and social benefits, for example:

- a. a 18.6% decrease in all-cause hospitalisations per person (or 10,354 averted hospitalisations per year across 186,016 people)
- b. a 5% reduction in school absence for illness for children (with 5,309 more days in school per year across 57,626 children)
- c. a slight but persistent increase in wages and less need for benefits for adults.



The benefits of the HHI exceed the cost to Health NZ after one year with a five-year return on investment of 507%, that for every one dollar spent by Health NZ, there was \$5.07 in health savings over the following five years.



The HHI is an excellent example of social investment. For example, since its inception, the HHI has: used multiple sources of data/evidence to understand people's needs and preferences; informed the design of effective interventions (aligned with these needs); and measured the effectiveness of different approaches to support the case for expansion and further investment.



Feedback from whānau supports these findings and the positive and long-lasting improvements in holistic wellbeing following the support from the HHI.



The HHI dataset is the country's largest dataset that is designed and collected by community providers (with over 100,000 people included within it) and successfully linked to the Integrated Data Infrastructure.



# INTRODUCTION

The Healthy Homes Initiative (HHI) Outcomes Evaluation assesses the health and social outcomes for the referred child/person and their whānau/household up to five years after the HHI intervention, and whether the programme offers value for money. This is the first report containing data from all regions across Aotearoa.

This evaluation expands on previous work in 2019 and 2022, (1-4), examining the impact of the HHI over a longer timeframe and a larger population.

The previous evaluation, in 2022, examined the effects of the HHI on participating children and their whānau for up to three years following the first HHI visit. (1)

The evaluation is co-funded by Health NZ, Kāinga Ora, Homes and Communities and ACC.

## CASE STUDY ONE

# Mapihi

Nine years ago, Mapihi and her family lived in a home that was mouldy with no insulation in the flooring and ceiling. The state of their home left her son very sick with strep A quite often.

The advice, advocacy and interventions she was provided with by the HHI enabled her to keep her whare, and especially in her son's room, much warmer. Mapihi's family's health has improved and their lives are back on track.

*“I think if it wasn't for the healthy homes... I think he would have been a sickly boy and would have been in and out of the hospital.”*

Mapihi's son is now the healthiest he has ever been. “He isn't as tired and drained.” Now her son is playing sports. “He plays second-five in rugby ... and he is the captain of the team. He is a very active boy now.” He is also succeeding academically due to getting better rest. “He's that boy that's just like you know 'oh I've got a merit.' I'm very proud.”

Mapihi and her family are grateful for the knowledge that has been passed on to her by the HHI and the help they received to provide a better home for her whānau.



## BACKGROUND TO THE HEALTHY HOMES INITIATIVE

The aim of the HHI is to increase the number of children living in warm, dry, and healthy homes and to reduce avoidable hospitalisations and ill health due to housing-related conditions.

The HHI was established in Auckland in December 2013 as part of the Rheumatic Fever Prevention Programme and was rolled out to the other high-incidence districts in 2015. The initiative initially focused on low-income whānau with children at risk of rheumatic fever. In 2016, the eligibility criteria was expanded to include children aged 0-5 years and pregnant people. Budget 2021 provided additional funding to expand the HHI to the remainder of the country and the national roll-out was completed in early 2023.

The HHI is funded by Health NZ, who provide national oversight, relationship management, and facilitation across the network of providers and partners. The programme is delivered by 17 lead providers and sub-contracted providers across the country, including health, home energy performance, Pacific, Hauora Māori, Iwi and urban marae-based organisations. HHI provider organisations form partnerships and receive government, community grant and philanthropic funding to support the interventions.

The HHI three-year Outcomes Evaluation concluded that HHI involvement significantly improved health outcomes. After the HHI intervention the number of hospitalisations per person was reduced by 19.8% (or 9,744 across the HHI cohort per year). Hospitalisations that occurred were shorter and less severe on average than hospitalisations prior to the HHI intervention. There was a small but statistically significant reduction in days off school for medical reasons, resulting in approximately 1,870 more days at school across the whole HHI cohort.

There was a 4% increase in employment for adults aged 24-64, and a moderate reduction in the cost and number of government benefits received by whānau. The report concluded that the HHI is a highly cost-effective programme with over \$200m in measurable societal co-benefits.

## HHI TODAY

Today, the HHI operates nationwide and is available to eligible low-income whānau (including those at risk of rheumatic fever) and pregnant people.<sup>a</sup> Whānau are referred to the HHI by a range of community and health organisations and can also self-refer. After meeting with the whānau and assessing their home and situation, HHI assessors provide:

- *Education about how to maintain a healthy home environment.* This may include information about heating, ventilation and mould removal; how to position beds to reduce the health implications of crowding; and advice on choosing electricity providers and plans that best meet their needs.
- *Immediate interventions.* Resources available to HHI assessors depend on the region and include portable heaters, beds, bedding, mould-cleaning kits, draught proofing, and floor coverings.
- *Support to access housing improvements.* This includes insulation and heat pumps via the Energy Efficiency and Conservation Authority (EECA) Warmer Kiwi Homes programme and, in some regions, curtains or minor repairs services delivered by other organisations. Public housing tenants are referred to the Kāinga Ora, Right at Home programme for home repairs and maintenance.
- *Referral to other services.* This includes referral to the Ministry of Social Development (MSD) for full and correct benefit entitlement assessment, assistance to join the public housing register for those in need of public housing, and a range of health and other services as relevant.
- *Advocacy to landlords.* With tenants' permission, assessors will contact landlords to request and advocate for improvements or repairs. In some cases, they will support tenants at the Tenancy Tribunal, sometimes with the help of other organisations.

The HHI is not a “one size fits all” approach - each intervention is tailored to the needs of the household. Interventions provided by the HHI depend on several factors. These include the capacity of the HHI provider, available resources, and ability of the whānau to participate in the programme. Funding can be a limitation especially where HHI providers do not have funding to support interventions and whānau are not eligible to receive government-supported grants.

The HHI brings together different government agencies working together towards common goals. The Right at Home programme prioritises maintenance work and improvements to Kāinga Ora homes recommended by HHI assessors. HHI assessors facilitate access to funding provided by EECA to install heating and insulation for eligible whānau and refer people to MSD for a Full and Correct Entitlement Assessment. At the policy level, the HHI works with all of government to influence and inform policy decisions.

This evaluation is possible due to the data collation and management of HHI providers. In addition, HHI providers have worked with researchers to monitor temperatures in homes following HHI intervention, (5) and to contribute to qualitative work which sheds light on effects of the HHI not captured by this evaluation. (6-10) This work shows that, alongside the physical health improvements associated with HHI involvement, people feel happier and more at home in their dwelling, more able to be at home (as opposed to staying elsewhere) and able to use more parts of their house. (8,10)

a. Pregnant people <https://www.tewhātuora.govt.nz/health-services-and-programmes/healthy-homes>



# METHODS

## REFERRAL DATA

This evaluation is an analysis of individuals and their whānau who have been a part of a journey with a HHI provider. HHI providers graciously supplied referral information for individuals who participated in the programme between 2014 and 2023. This referral data includes the National Health Index (NHI) of the individual for identification purposes, as well as many variables collected as part of the in-home assessment, the interventions provided (what and when), and whether the intervention requirement was fully satisfied.

For this analysis, the study cohort includes both the referred person and their household. To generate this cohort and measure outcomes, the HHI referral dataset was linked to the Stats New Zealand Integrated Data Infrastructure (IDI). The IDI contains linked microdata for individuals who live in NZ and includes information from government agencies, national surveys (including the census), and non-government organisations. The IDI is maintained by Stats NZ, the government data agency. All the data on the IDI is deidentified and can only be accessed within secure environments under the “five safes framework” – safe people, safe projects, safe settings, safe data, and safe output. Furthermore, at the time of data collection, individuals provided consent to have their data linked to the IDI.

## LINKAGES ON THE IDI

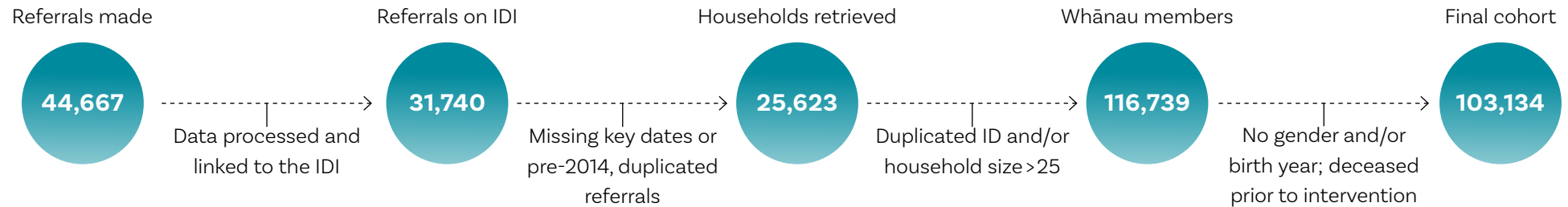
Data on the referred individual were linked to the IDI using the NHI number, a unique identifier assigned to each person who receives healthcare in NZ. Within the IDI environment, individuals are then assigned a Stats NZ identifier (SNZ\_UID) based on their NHI. This SNZ\_UID enables data to be linked across datasets, including those from different providing organisations.

The evaluation study cohort was generated by linking the referred person (which was usually a child) to census information to construct households. If census information were not available, such as if the child had not been born at the last census date, attempts were made to construct households by linking the child’s data to their parent’s census information. This report has been prepared using the 2018 individual and household census data and the June 2023 refresh of the Stats NZ database which contains data up until 30 June 2023.





Figure 1: Development of linked HHI study cohort



To evaluate outcomes for participants, the study cohort was linked to government records. To assess the impact of the HHI on health outcomes, hospitalisation data were used as a proxy. These records were taken from the National Minimum Dataset on the IDI. This dataset was provided by the Ministry of Health and included administrative data collected during publicly funded outpatient events. GP visits and pharmaceutical outcomes used data from the Pharmaceutical Claims Collection, another Ministry of Health dataset

available in the IDI which contains information about subsidised pharmaceutical dispensing. For the social outcomes, student absenteeism data was accessed from the Ministry of Education in the IDI for primary and secondary schools, and income from wages, salaries, and main benefits was extracted from the IDI income calendar year summaries table. This table records the total income from wages, salaries, and main benefits (along with other sources) at the monthly level and is supplied to Stats NZ by Inland Revenue.

## COST-BENEFIT ANALYSIS

The cost-benefit analysis takes a health perspective and focuses on the costs and benefits that accrue to the health sector. This means that core staff funding for the programme from the Ministry of Health (and now from Health NZ) is accounted for in the analysis. However, other costs, such as volunteer time and interventions provided through philanthropic organisations, are not accounted for in the analysis.

The main benefits that we examine are reductions in healthcare costs paid by the government (e.g., publicly funded hospitalisations). However, we also

examine the social benefits that accrue from a societal perspective. For instance, if the HHI substantially reduces illness in households, it may lead to fewer sick days for children and adults (particularly for parents, who often need to take leave for their own illnesses as well as for their children's illnesses). Fewer medically related absences from employment could not only increase parents' earnings, particularly for those who are not on salary, but also increase their ability to participate in the labour force. All of these can lead to increased income and potentially reduced benefit income.





## PROGRAMME COST DATA

The main costs of the HHI are frontline staffing costs funded through Health NZ. These costs were \$78,456,336 to December 2023 in nominal dollars.<sup>b</sup> The costs of the interventions themselves (e.g., curtains, bedding) were largely funded by philanthropic and community partners,<sup>c</sup> such as Variety - The Children's Charity, and support from other government agencies especially EECA<sup>d</sup> and Kāinga Ora. The EECA support focuses on improved access and co-funding for the Warmer Kiwi Homes grant and its predecessors. This grant currently covers retrofitted insulation and high-quality heating for low-income homeowners.

## SAMPLE DESCRIPTION

As of December 2023, a total of 44,667 referred individuals had participated in the HHI. Of these, referral data are available for 31,740 which are available on the IDI database. This makes the HHI dataset the largest collection of housing intervention data worldwide. After a thorough data cleaning process, which included removing individuals who were missing data for key variables as well as duplicated referrals, the evaluation study cohort contained 103,134 individuals from 24,765 households. The data linkage process was conducted using Structure Query Language (SQL) and successfully linked 72% of individuals to a household, with only 7,020 households defined by just the referred person.

- b. To put these total costs into real dollars (2023 NZD), they were divided into even annual amounts and adjusted to 2023 NZD accordingly using the CPI (All Groups for New Zealand). This resulted in a total real programme cost of approximately \$92.7 million (2023 NZD). From the three-year evaluation, these costs were estimated at \$ 55,651,000 to December 2021, indicating that the average annual expenditure for 2022 and 2023 was about \$ 11.4 million per year. Using this information to estimate the total programme cost in real dollars (2023 NZD), the total programme cost is approximately \$91.4 million (2023 NZD).
- c. In 2022 and 2023, Variety Children's Charity donated more than \$497,000 to the HHI partners for beds and bedding.
- d. Some households in the HHI programme benefited from EECA's subsidisation of insulation and heating through the Warmer Kiwi Homes. Generally, EECA subsidises 80% of the cost with the other 20% being covered by charitable organisations in some HHI regions. However, EECA contributed more than an additional \$150,000 directly between September 2023 and July 2024 to cover the remaining 20% when other funds are not available. The total cost of just these cases where EECA covers the full cost, then, is more than \$750,000. The full cost of providing insulation and heating for HHI households has not been estimated and is not included in the total cost of the HHI programme given the healthcare perspective being used.



## EVENT DEFINITIONS

**Hospitalisations:** The hospitalisation data is available from the Ministry of Health for public hospital admission events. Each datapoint in these records provides a separate hospitalisation event featuring a variety of information, including admission and discharge dates. Occasionally this data captures transfers between hospitals or wards as well as same-day readmission events which, in rare cases, may have been counted separately. Ministry of Health cost weighting information was used to estimate hospitalisation costs. Only data for individuals aged one month to 90 years were included in the analysis to avoid events related to birth or extreme old age.

**Days absent:** Student absenteeism data is available from the Ministry of Education in the IDI for primary and secondary schools. This is measured as the total number of school absences in a school year for medical reasons<sup>e</sup> (full or partial days) before the intervention or in the school year after the start of the intervention period. The period prior to the intervention is measured as the total days absent for medical reasons recorded in May or June. The sample for this analysis is limited to students in our cohort aged 6 to 15<sup>f</sup> that could be matched to school absenteeism data in both the pre- and post-intervention periods.

**Wage income:** Income data was extracted from the IDI income calendar year summaries table for the HHI recipients aged 25-60<sup>g</sup> who received the HHI intervention between 2014 and 2018. This table records the total income from wages and salaries, and other sources, at the monthly level and was supplied by Inland Revenue. The monthly wage and salary income was summed for the

12 months<sup>h</sup> prior to the start of the intervention period (pre-intervention wage income) and for the 12 months after the end of the intervention period (post-intervention wage income). If no wage income was found for a given period, then that was assumed to be zero.

**Benefit Income:** We extracted monthly benefit income data for the HHI population aged 25-60 who received their intervention between 2014 and 2018, using the same income tables used for the wage income measures. The pre- and post-intervention measures for benefit income were constructed similarly to the wage income measures, using the 12 months before and after the intervention period respectively.

**Pharmaceutical Receipt:** Ministry of Health Pharmaceutical tables available in the IDI were used to analyse receipt of pharmaceuticals for the HHI study cohort. This dataset features a subset of variables from the Pharmaceutical Claims Collection which specifically includes subsidised pharmaceutical dispensing. Only data for individuals aged one month to 90 years were included in the analysis to avoid pharmaceutical receipt related to birth or extreme old age.

**GP Visits:** Ministry of Health pharmaceutical data was used as described previously to analyse GP visits. Only non-repeat pharmaceutical dispensations were considered, and as with the pharmaceutical receipt analysis, only data for individuals aged between one month and 90 years were included.

- 
- e. The types of absences for medical reasons included in the sample are medical appointment (doctor or dentist), short-term illness/medical reasons, or student in sickbay. Examples of other types of absences that are not included in our analysis include absences due to suspension, justice court proceedings, holiday etc.
  - f. We limit the sample to these ages to increase the likelihood that the children will have both pre- and post-intervention data. Approximately 2500 students were not able to be linked to absenteeism records in both periods.
  - g. We limit the sample to these ages to minimise early- and late-stage career effects and to increase the likelihood of the individuals being in the labour market.
  - h. We limit the pre- and post-intervention periods to 12 months in order to minimise the impact of life events on the results.



# UNIT OF ANALYSIS

Following the linkage procedure detailed previously, each household member in a HHI household is considered as an individual unit. Some participants in the HHI may have contributed multiple referrals to the HHI referral data. These rare cases occur where a referred person may have moved accommodation and therefore repeated the HHI process. In this event, these separate referrals are considered as distinct, given that each relates to a different time point and there has been a

demonstrated break in receiving the “effect” of an HHI intervention.

Intervention date information was taken from the primary referral. Pre/post-intervention periods were calculated for each member of the household using information on when the referral was placed and the housing assessment was conducted. It is assumed that there was a uniform 90-day period of intervention delivery following the in-home assessment.

# ANALYTICAL APPROACH

Every individual in the study cohort was assigned a five-year period before the home assessment was completed and after the intervention was completed. These periods are defined as the “pre-intervention” period and the “post-intervention” period. The 90-day period between the assessment date and end-of-intervention date was intentionally excluded as a washout period. This is demonstrated in Figure 2.

The analytical approach utilised a pre/post analysis methodology. For each of the scenarios detailed, the number of events in pre- and post-intervention periods were totalled. The post-intervention total was then compared to the pre-intervention total, and the change between the periods calculated.

Each individual in the study cohort contributed a maximum of ten datapoints to the analytical dataset, one for each year of the pre- and post-intervention periods. For each data point, the individual’s age was calculated using date of birth data. Age was calculated as the age of the individual at the mid-point of the outcome year and where an individual’s age fell outside of the analysis range at any point in the year (detailed in the event definition section), data were excluded. In the modelling process, care was taken to adjust for variables which may have affected the accuracy of estimates from the pre/post analysis. These are detailed in the following section.

**Figure 2:** Example of analytical approach for three hypothetical HHI participants

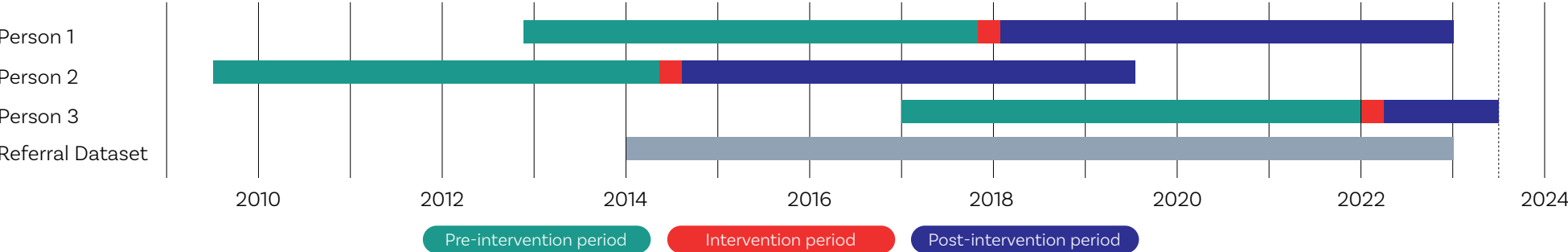


Figure notes: Data shown until June 2023, the latest data for data available in the June 2023 refresh of the IDI. Intervention date data sourced from referral information for the referred household member

## CORRECTIVE ADJUSTMENTS

The primary corrective adjustment used within the modelling process was the use of yearly aggregated data as the dependent variable, rather than other aggregations (weekly, monthly etc.) or individual event data. This process eliminated the necessity for additional variables to estimate the impact of generalised seasonal trends on the number of events. This is particularly important for the winter period (June to August) where sickness commonly increases.

Additional variables were included in the analysis to reduce any potential biases in the statistical modelling process. These correct for any variances in the data analysis which may be attributed to causes other than the HHI programme. They have been included in the statistical models regardless of whether these variables were considered statistically significant. This is to improve the estimate of the effect attributable to the HHI programme.

### Age effect

The risk of hospitalisation and other health outcomes is not constant over the life course and therefore, variables were added into the model to allow for changes in hospitalisation risk at different ages. These adjustment variables incorporated

additional risks for children (one month to 8 years), teenagers (over 8 years to 18 years), and adults (50 years and above). The adjustment variables allow for the statistical model to deviate from a baseline over each of the age ranges. The effect of these variables is illustrated in figure 3, where the hospitalisation risk has different trend lines between the cut-off points.

### Covid-19

To adjust for the effect of Covid-19, five indicator terms were added to the health outcome model. These terms were binary indicators generated to absorb some of the variation in hospitalisations due to effects caused by the Covid-19 pandemic, which continues to affect healthcare systems globally.

To generate these indicators, binary terms were created for each 6-month period from 2020 to 2022. If a hospital admission stay overlapped with the 6-month period, the indicator variable was assigned as a 1 otherwise, 0. Whilst not all these variables were statistically significant, they were important design variables to ensure that the statistical modelling better approximated the “real-life” scenario of the NZ healthcare system.

### Estimating Uncertainty

To allow for uncertainty, model estimates in this report are provided with 95% confidence intervals, where confidence intervals provide a plausible range for a given estimate. The mathematical equation to calculate confidence intervals is inversely proportional to the size of the study cohort. Given the large number of individuals in the analysis, confidence intervals are very small but have been included for completeness.

### Limitations of the Referral Data

Within the primary source data, the provider referral data, a single household may exist multiple times. Where these referrals shared the same date information, they were classified as true duplicates and were collapsed to a single referral. However, a referred person may have had multiple referrals with different assigned dates. These events are rare but mostly occurred when an individual and their whānau changed address, and the new home required interventions from the HHI programme. This data was considered as separate referrals, each with a separate outcome period.

# RESULTS

## COHORT DESCRIPTION

**Table 1:** Characteristics of Linked HHI Cohort

Variable	Count*	Relative Percentage (%)	
Age at earliest intervention	<2	12,147	11.8%
	2-4	11,403	11.1%
	5-17	31,950	31.0%
	18-24	9,843	9.5%
	25-44	25,413	24.6%
	45-64	8,925	8.7%
	>64	1,983	1.9%
	Born post-intervention	1,476	1.4%
Ethnicity**	Māori	51,663	50.1%
	Pacific	46,092	44.7%
	European	29,046	28.2%
	Asian	5,433	5.3%
	MELAA	2,454	2.4%
Sex	Male	47,358	45.9%
	Female	55,776	54.1%
Tenure	Owner occupied	20,748	21.8%
	Kāinga Ora - Homes and Communities	35,373	37.2%
	Private market rental	35,640	37.5%
	Other	3,273	3.4%

Table notes: \*Unweighted counts have been rounded for confidentiality \*\*Total response; multiple ethnicities allowed.

The linked evaluation study cohort contained 103,134 individuals from 24,765 households.

Two age groups dominated the cohort: children and teenagers aged 5-17 (nearly a third of the cohort), and those aged between 25 and 44 (nearly a quarter of the cohort).

About half the cohort self-identified as Māori. The evaluation study cohort also featured a high proportion of individuals who identified as Pacific ethnicity.

Individuals were most likely to live in rental accommodation with a similar proportion of participants living in private rental housing and social (Kāinga Ora) housing. Individuals were least likely to live in owner-occupied housing (including owned in a whānau trust).



# HEALTH OUTCOMES

## HOSPITALISATIONS

**Figure 3:** Predicted risk of hospitalisation by age (years) for HHI study cohort pre- and post-intervention

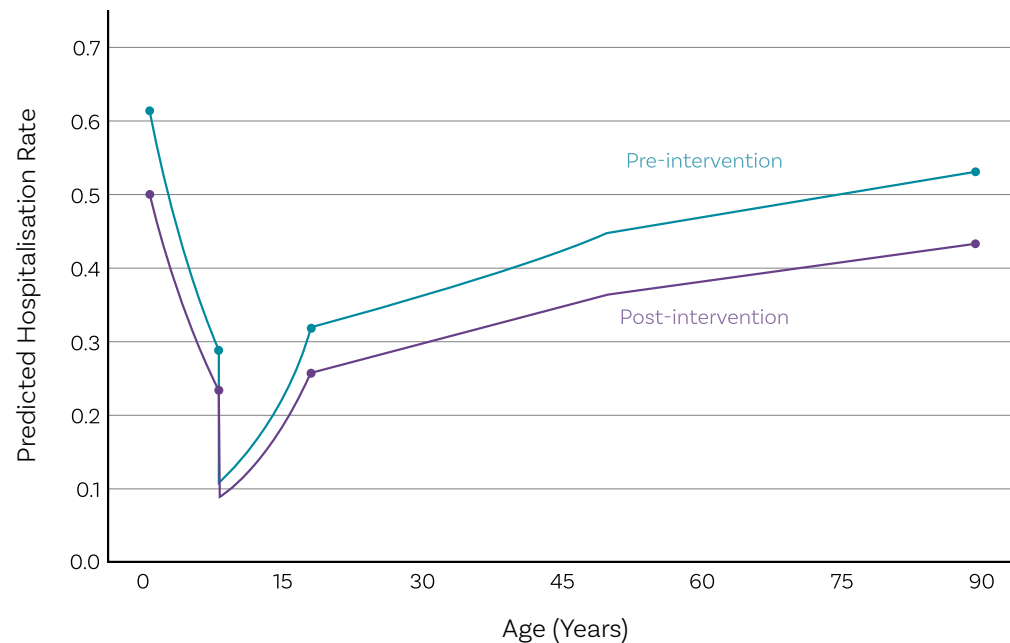


Table 2 shows the effect of the HHI programme on all-cause hospitalisation numbers. From the statistical model the rate of **hospitalisation was 18.6% lower** per person in the five years following an HHI intervention than in the five years before. This was reflected in an incident rate ratio (IRR) of 0.814 (CI: 0.80, 0.83) which was statistically significant with a p-value of less than one in 10,000. Figure 3 shows the modelled predicted risk of hospitalisation, where the risk of hospitalisation is reduced for all ages including age 8 where the graph appears to converge. This plot also shows the impact of the life-course adjustment variables which allow for changes in hospitalisation rate over important age groups.

The **18.6% reduction in hospitalisations** indicates that the HHI programme prevented 5,741 hospitalisations per year in the linked cohort or approximately 0.037 hospitalisations per person per year. Using the evaluation study cohort, this model predicts that 28,704 hospitalisations were averted in the five years following the HHI intervention. Using the 44,667 referrals carried out, the predicted impact of the HHI intervention scales to an estimated 10,354 averted hospitalisations per year. Further analysis (not shown) indicated that the positive impact of the HHI has a consistent effect over the five-year analysis period with no evidence of any decrease.

**Table 2:** Results of modelling of hospitalisation numbers

Model term	Incidence Ratio (95% CI)	P-Value
<b>HHI Effect</b>	<b>0.814 (0.800, 0.828)</b>	<b>&lt;1:10,000</b>

## RECEIPT OF PHARMACEUTICALS

**Table 3:** Results of modelling of receipt of pharmaceuticals

Model term	Incidence Ratio (95% CI)	P-Value
<b>HHI Effect</b>	<b>1.02 (1.00, 1.03)</b>	<b>0.0140</b>

According to the model estimates, the **receipt of pharmaceuticals increased 2%** in the five years following an HHI intervention (IR: 1.02 [1.00, 1.03]). This estimate was statistically significant with a p-value of 0.014. Additional model variables for age highlight the change in pharmaceutical receipt over the life course, with reduced dispensations for children but increasing dispensations with age. Covid-19 adjustment variables were mostly significant with differing trends, reflecting the impact of the pandemic on pharmaceuticals.

## GP EVENTS

**Table 4:** Results of modelling of GP visits

Model term	Incidence Ratio (95% CI)	P-Value
<b>HHI Effect</b>	<b>0.984 (0.978, 0.991)</b>	<b>0.0140</b>

Statistical modelling estimates show that **GP visits reduced by 2%** in the five years post-intervention (IR: 0.984 [0.978, 0.991], p-value: 0.014). This contrasts with the analysis of pharmaceuticals, presented above, and indicates that the increase in receipt of pharmaceutical were driven by repeat prescriptions.

Additional modelling variables show children visit the GP at a lower amount compared to other ages, despite having fully funded visits. The amount of GP visits was estimated to increase with age. All Covid-19 indicator variables were statistically significant but, once again, reported differing trends.

## CASE STUDY TWO

# Kathleen

Kathleen shares her transformative experience with a HHI provider, which has impacted her whānau for over seven years.

Kathleen's son struggled with pneumonia, leading to frequent hospital visits and a stay at Starship hospital. Her other children were often sick, and her father had significant medical challenges. The whānau home was cold and in disrepair, with broken windows and water damage. They had normalised these conditions, unaware of their impact on their health.

After being referred to their local HHI and home repairs programme, their living conditions improved dramatically. The whānau received necessary repairs, insulation, and health resources, which addressed their ongoing health concerns.

Today, Kathleen expresses gratitude for the support received, noting that her whānau is now thriving. Their children are excelling in sports, and participating in various extracurricular activities, with some even representing Wellington and New Zealand in their chosen sports. Her father is enjoying a fulfilling retirement, living in a healthier environment. Overall, the whānau wellbeing has significantly improved, ensuring the wellbeing of her whānau for generations to come.





# SOCIAL OUTCOMES

## EDUCATION

**Table 5:** Results of modelling of student absenteeism

Model term	Incidence ratio (95% CI)	P-value
<b>HHI Effect</b>	<b>0.952 (0.921, 0.983)</b>	<b>0.0030</b>

Table Notes: The sample includes 6-15 years old. The number of students is 7,989.

The models show a reduction in school absences for medical reasons of 5%, or 5,309 days per year across all the children (Table 5). Unfortunately, the education data for 2020, 2021 and 2022 was unusable due to Covid's impact on education data, so this analysis was only done on the education data 2014 to 2019 and looked at the year pre and post the intervention. The effect was significant when standard errors were applied but was not significant if robust standard errors were applied.

## BENEFIT INCOME

IRD records were used to examine the main benefit income received by people in HHI households aged 25 to 60 (such as Jobseeker Support, Sole Parent Support and Supported Living Payment). The analysis included one year before and after the intervention date and a panel regression, where the dependent variable was the nominal value of the main benefit amount received. The results show a significant decrease in the benefit amount in the year following the intervention.

## EQUITY

The HHI was equally effective for participants irrespective of their ethnicity. However, the HHI has a very high Māori and Pacific population relative to the general population. Therefore, the overall effect of the programme is to close the health gap between Māori/Pacific and the general population. A more detailed analysis of the effect on the Pacific population is planned for further work.

## WAGE INCOME

This analysis included adults aged 25-60 in the HHI households. This model was based on a panel regression with one year of observation before and after the intervention date. The dependent variable was the nominal value of wage income. The results showed that adults aged 25-60 in HHI households had an increase in wage income in the 12 months following the intervention, similar to the magnitude of the average decreased benefit.



## COSTS OF PROGRAMME AND COSTS AVERTED

The programme costs for this analysis were primarily related to staffing costs for the providers (including overheads) delivering the programme.<sup>i</sup> In nominal terms, these costs were \$78,456,336 for the 44,667 households served by the programme through December 2023 (or approximately \$1,756 per referral). In real dollars (NZD 2023), the estimated cost per referral was between \$2,000 and \$2,100.

As noted previously, these programme costs were specific to the government healthcare sector. It is important to note that; the costs of providing some of the interventions (e.g., the cost of providing beds or installing insulation) beyond these staffing costs were not included in this analysis. The costs of the products and services supplied by others such as philanthropic organisations or by other partners (e.g. Variety and EECA) were not included.

There were 103,134 individuals living in households covered by the programme (or 4.16 individuals per referral) after matching individuals in the IDI to the referral households as shown in Figure 1. We estimate there were 186,016 individuals that lived in the homes from all 44,667 referrals.

Given that approximately 33% of the IDI-matched individuals were aged 25-64, we estimated that 61,943 individuals aged 25-64 were impacted by the programme. Moreover, approximately 30% of the IDI-matched cohort was aged 5-17, which indicates that 57,626 children in this age range were treated by the programme annually. We use these numbers to estimate the social benefits of the programme.

**Table 6:** Coverage Statistics for Healthy Homes Initiative

	Referral Households	Individuals	Adults aged 25-64	Children aged 5-17
Referral cohort (IDI match)	24,765	103,134	34,338	31,950
Total intervention*	44,667	186,016	61,943	57,626

\*This includes both eligible and ineligible referrals.

i. These costs are primarily related to the following four components: setting up systems, generating referrals, coordinating interventions, and generating the supply of interventions.



The associated healthcare costs averted by the programme are shown in Table 7. Using the average cost of a hospitalisation pre-intervention (\$4,976), the 10,354 hospitalisations averted would have cost approximately \$51.5 million in year one post-intervention (Year 1), and hence, these costs were averted because of the HHI programme. The hospitalisations that did occur post-intervention were, on average, less severe, with this reduction in severity likely being due to the programme. This reduction in severity is estimated to avert costs of \$43.6 million in the first year following HHI intervention. The discounted totals for years 2-5<sup>j</sup> post-intervention are added to the Year 1 total to show the estimated costs averted in years 1-5 post-intervention. This total cost is also provided in the last column of Table 7.

In addition to hospitalisations, we estimate there were 14,121 fewer GP visits annually post-intervention. According to the New Zealand Treasury's CBAX Spreadsheet model, the Government's contribution to the cost of a GP visit is \$45 in 2018 NZD, which converts to approximately \$55 in 2023 NZD. Hence, the

dollar value of this reduction in GP visits across the population is estimated as \$776,637 in Year 1 post-intervention. Table 7 also shows the discounted total costs averted due to the reduction in GP visits in the 5 years post-intervention. For these calculations, we assume a constant reduction in GP visits across all years.

We also examine the effect of the HHI programme on prescriptions. Based on this analysis, the programme is associated with an increase in the number of prescriptions used by the covered population of 29,767 annually – this is represented as a negative reduction in Table 7. We use an estimated cost of approximately \$16 per prescription. In total, we estimate that this increase in prescriptions cost the healthcare sector \$473,288 in Year 1 post-intervention, which is shown as a negative because it offsets the other costs averted. It is possible the increase in prescriptions could be due to more individuals being treated outside of hospital.

**Table 7:** Healthcare Benefits of the Healthy Homes Initiative

Benefit	# per year	Cost per Unit (NZD 2023)	Years post intervention	
			Year 1	Total Years 1-5
Reduced Hospitalisations	10,354	\$4,976	\$51,517,492	\$214,959,273
Reduced Hospitalisation Severity	97,188	\$449	\$43,622,445	\$182,016,803
Reduced GP Visits	14,121	\$55	\$776,637	\$3,240,556
Reduced Prescriptions	-29,767	\$16	\$-297,665	\$-1,242,024
<b>Total Healthcare Benefits</b>			<b>\$95,443,285</b>	<b>\$398,241,814</b>

From this analysis, the costs of the programme to the public healthcare sector are expected to be recouped in Year 1. In real terms, we estimate the cost as between \$91 and \$93 million. Even with the increase in prescriptions, the Year 1 healthcare benefits are approximately \$95 million.

j. A discount rate of 6 percent as recommended by Treasury was used.

## OTHER POTENTIAL BENEFITS

The estimated dollar value of the potential social benefits was also analysed. We did not include these in the cost-benefit ratio for the program given the health perspective that has been selected for the analysis. These additional benefit estimates are simply to provide an example of the magnitude of the potential benefits of the HHI that go beyond the healthcare sector.

First, for education, the results were statistically significant only when we did not use robust standard errors for the analysis. Hence, the HHI may not have any

effect on absenteeism. However, if we were to assume that the positive effect is significant, we estimate 5,309 fewer student-days absent post-intervention for the 57,626 students covered by the program. We estimate the social value of a day of school was approximately \$91 per day in 2023 NZD,<sup>k</sup> and hence, the total value of this reduction in absenteeism would be approximately \$484,713 for year 1 post-intervention. Discounting this value in post-intervention using a rate of 6 percent as recommended by Treasury<sup>l</sup> gives a five-year total discounted value of \$2,022,488. These results are shown in Table 8.

**Table 8:** Social Benefits of the Healthy Homes Initiative

Social Benefit <sup>l</sup>	# per year	Cost per Unit (NZD 2023)	Years Post-Intervention	
			Year 1	Total Years 1-5
Reduced days absent	5,309	\$91	\$484,713	\$2,022,488

Our results also indicate that, post-intervention, there is a reduction in main benefit income (statistically significant), which is about \$1670 per person aged 25-60 on average. These averted costs would apply when taking a government perspective, but often are not counted when taking a societal perspective, since the societal benefit generally comes from increased employment. In fact, one estimate of the reduction in benefit income in this analysis is on par with the estimated increase in wage income, which indicates that most of the increase in wage income is likely due to those on a main benefit increasing their income through employment.

The results for wage income were generally positive but statistically insignificant, which indicates that wage income likely increased post-intervention.

The only model where the result was statistically significant included controls for employment in both periods (e.g., employed pre and post intervention; not employed pre and post intervention). In the models where the results were not statistically significant, the results indicate that the increase would be approximately \$494 per person aged 25-60, on average, if it were significant (or a 2.7% increase) in Year 1 post-intervention. In the model where the result was statistically significant, the results indicate that the increase in wage income due to the intervention would be \$1,489 per person aged 25-60, on average (an 8% increase) in Year 1 post-intervention. If we were using a whole-of-government perspective, the benefit to the government would be the increase in tax revenue generated from this income. In an analysis which uses a societal perspective, one would count the full amount of the increased employment income.

k. In 2018, the annual cost per student for primary, secondary, and post-secondary non-tertiary education was estimated by the OECD at approximately USD 10,000 or NZD 14,450. See more information <https://www.oecd-ilibrary.org/sites/a6e9b4ee-en/index.html?itemId=/content/component/a6e9b4ee-en#section-d12020e16169>. In the 2018 school term, there were 190-192 days of school in total according to the Ministry of Education. Hence, the cost per day per student is approximately NZD 75. Converting this into real terms, the cost per student day is approximately \$91 in 2023 NZD.

l. While the interventions occurred over many years, the totals for each year post-intervention have been aggregated. Hence, the total cost-savings for the earliest year post-intervention, second year post-intervention, etc.



### CASE STUDY THREE

## Kataraina

A Māori whānau with 11 children were initially referred to the HHI nine years ago.

The whānau had recurring Strep A throat infections and were at extremely high risk of developing rheumatic fever. Over 20 whānau members lived permanently in the whānau owned two-bedroom whare with a number of temporary cabins also on the property.

Interventions such as curtains, bedding, a mould kit and draft proofing were provided to the whānau. The whānau noticed a significant difference to the health of the children after the involvement of the HHI especially with less strep A infections.

The whānau were re referred to the HHI six years ago and were seen by the same HHI kaimahi that visited the home initially.

Education was reiterated and support provided to have the whānau bathroom, kitchen and septic tank repaired through the HHI's partnership with Te Puni Kokiri for critical home repairs.

Mum Kataraina is grateful for the long-standing relationship that was built with the HHI kaimahi and said that "after being visited by the HHI there was an immediate reduction in the amount of Strep A infections and now nine years later there is no Strep in the whāre and there has been a substantial decrease in all other illnesses for the whānau overall". Kataraina still utilises the information that was shared with her by the HHI.



# DISCUSSION

This evaluation shows that the HHI is important for improving health for individuals living in low-quality housing and at risk of associated health problems. While the focus of the HHI on health and wellbeing of low-income whānau and pregnant people, this analysis also shows that the programme is making a difference to other areas of wellbeing including school attendance and employment.

The large health effect with a broad range of other benefits is consistent with the delivery of the HHI. Which is primarily a health programme, the HHI aims to enhance its impact by reaching all applicable determinants of health. The effects on health outcomes are consistent with previous analyses. The 18.6% per person reduction in overall hospitalisation aligns with the previous three-year evaluation report (19.3%). The 18.6% decrease in hospitalisations is larger than the 11.8% decrease attributed to the insulation and heating alone in low-income households with children in the Warmer Kiwi Homes programme, which was the most cost-effective group in a highly cost-effective programme. Our findings build on a large body of New Zealand and international evidence that improvements in housing quality led to improved health outcomes. (11)

Like the Warmer Kiwi Homes programme, which has shown consistent health improvements after 12 years, our analysis suggests that the HHI programme interventions remain effective at least five years later.



## STATISTICAL POWER AND THE IDI

The very large data size of 103,134 people gives a lot of statistical confidence in the validity of our estimates. The ability of the community-based HHI to collect such volume of data makes this analysis possible. If other large-scale programmes with impact on social determinants were to collect similar data, it would be relatively easy to compare outcomes.

## LIMITATIONS OF THE ANALYSIS

The analysis presented was based on a simple before and after model adjusting only for age and Covid-19. It is impossible to know exactly what would have been the changes for the whānau in the absence of an HHI referral. Our implicit assumption is that on average the health and social outcomes would have remained the same. With this assumption our analysis is focused on reporting the changes associated with an HHI referral, rather than the causative change due to an HHI referral.

A further limitation of this research is the use of administrative government data as a proxy for health and social outcomes. For example, hospitalisation records were used to best approximate health, and tax data were used to estimate income from benefits, wages and salaries. Unfortunately, these records are only a proxy. Barriers to accessing healthcare affects how well health data represents the health of participants. Additionally, tax data does not account for untaxed or unreported employment earnings. Moreover, by not looking at total income, it is possible that changes from other income sources may affect people's main benefit or their employment decisions. This can affect our ability to fully estimate changes in income from these sources attributable to the HHI programme.

## CASE STUDY FOUR

# Inaya

Inaya and her family had moved from India to New Zealand over five years ago and were referred to the HHI due to the children having repeated Strep A throat infections. The eldest son had also had bronchiolitis, and Mum was concerned as they had not experienced these health conditions in India.

The family were living in a rental that was very damp and unventilated, they didn't open their curtains for privacy and security reasons. There was mould throughout the home, and it was particularly bad in the bedrooms.

The HHI kaimahi visited the home and identified that the family did not know that dampness and mould in their home could trigger respiratory conditions. The kaimahi spent time sharing healthy housing key tips and helped mum to start cleaning off the mould. With the consent of the family the kaimahi advocated with the tenancy manager to have an extractor fan installed in the bathroom.

On subsequent visits the assessor noticed that the curtains were now open, and they were continuing to ventilate and remove mould. Mum was so happy as both of her boys had gone through a winter free of illness and had had no time off school. She was so grateful for the support and education that was provided to her.

The HHI kaimahi has continued to keep in touch with this family and now five years after the initial referral they are all doing really well. There have been no hospital visits and both sons were achieving academically. They are now in a new rental, and they now have the confidence to discuss any housing concerns with their landlord.



## KEY FINDINGS

Adjusting for ages and other factors, we compared outcomes for participants in the five years before and after HHI intervention.

Between January 2014 and December 2023, The HHI has completed 44,667 referrals, that equates to over 186,016 people.

Over half (54%) were below 18 years of age, 50% identified as Māori and 45% identified as Pacific.

**Hospitalisations:** The rate of hospitalisations per person following the HHI intervention reduced by 18.6%. This equates to 10,354 averted hospitalisations per year across the HHI. Those in the household who were hospitalised had less severe conditions.

**GP visits & Pharmaceuticals:** GP visits reduced by 2% and pharmaceutical dispensations increased by 2%.

**Education:** School absences for ill-health was reduced by 5%. This equates to an additional 5,309 more days in school for kids.

**Income:** There was an increase in income for adults and a decrease in the number of people on benefits post-intervention.

**Costs and benefits:** The return on investment from the health sector was 507%. The primary costs associated with the HHI is staffing costs. Staffing costs are estimated to be between \$2,000 and \$2,100 per referral. The costs of the programme to the health sector are estimated to have been recouped within a year, with healthcare benefits of approximately \$95 million per year exceeding the costs associated with staffing and increased pharmaceutical dispensing.

## CONCLUSION

The Healthy Homes Initiative is providing a significant long-term impact for whānau whilst producing an impressive return on investment to the public healthcare sector, even in the first-year post-intervention. In the first five years post-intervention, the expected savings in healthcare costs are approximately \$300 million. In addition to these impressive returns, which are attributable to significant improvements in health outcomes, there are indications of social co-benefits including more days at school for kids and higher employment

earnings for those of working age. With a strong social investment approach, the HHI is meeting its goal of improving the health and wellbeing of whānau in Aotearoa through smart financial investment in community-led holistic housing interventions. The HHI programme supports the goal of health equity for all by targeted intervention for low-income whānau with a strong focus on Māori and Pacific peoples.





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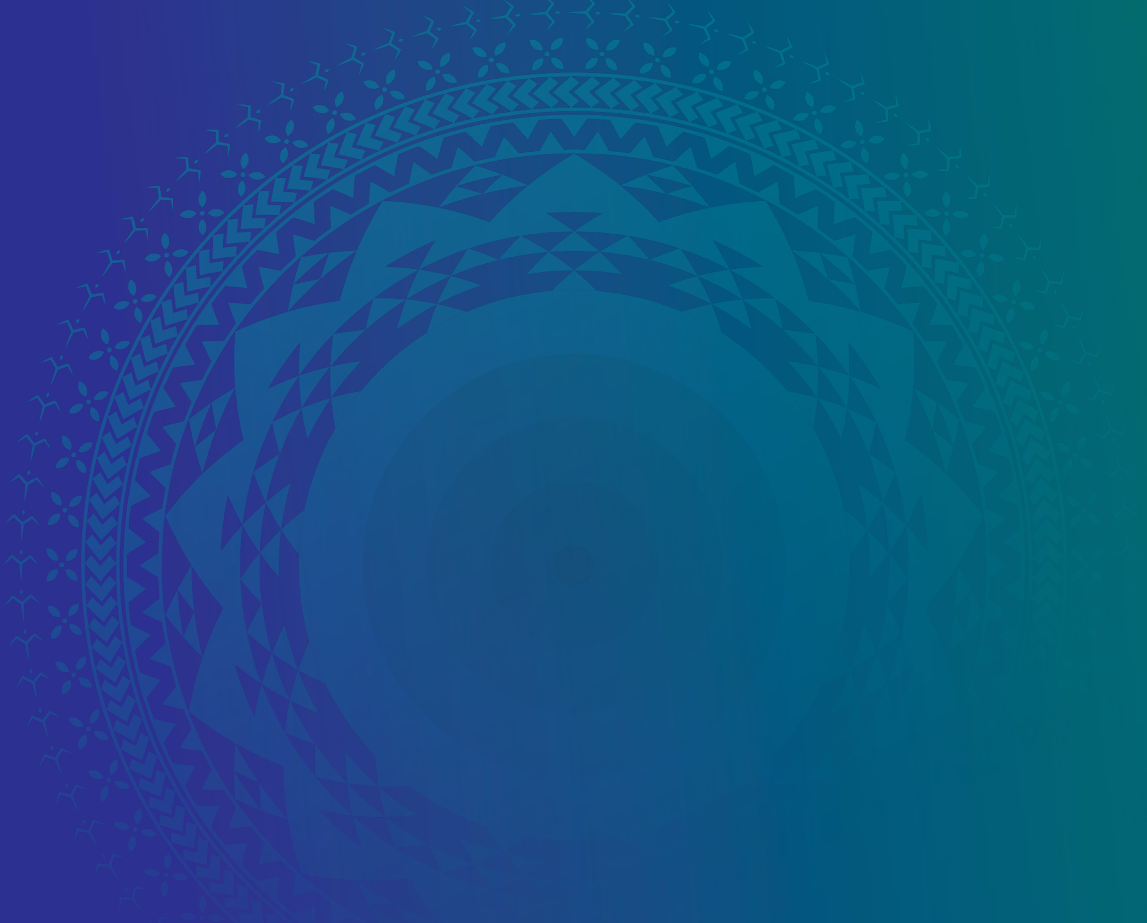
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## HEALTHY HOMES PARTNERS







# Healthy Homes Initiative

*Five year outcomes evaluation*

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